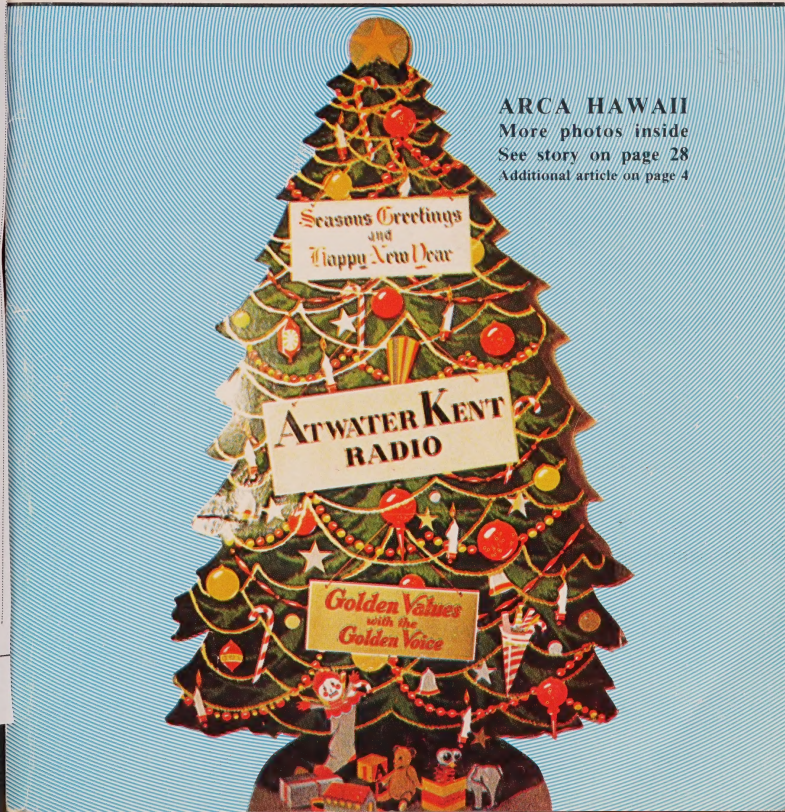
THE ANTIQUE RADIO GAZETTE

VOL. 19 WINTER 1991 NO. 4



ARCA HAWAII
More photos inside
See story on page 28
Additional article on page 4

The Antique Radio Gazette is the official publication of The Antique Radio Club of America, Inc.

If you would like to publish an article or series of articles in The Gazette, or have questions pertaining to the publication of The Gazette, contact one of the following associate editors:

Ralph W. Williams
R. D. 1, Box 44
Orient, NY 11957

Ralph Thorn
61 Maple Pl.
Huntington, NY 11743

Christopher Bacon
16 Garrity Avenue
Ronkonkoma, NY 11779

James L. Troe
111 Skyline Drive
Morristown, NJ 07960

Jerry and Marsha Simkin
10 Avalon Lane
Matawan, NJ 07747

Ken Kelly
Apt. B
315 West Jefferson Street
Media, PA 19063

John and Ruth Drake
23 East Wharf Road
Madison, CT 06443

All other material that is ready for publication should be mailed to:

ARCA-GAZETTE
4204 Thornapple Lane
Charleston, WV 25313
or FAX 304-344-8083

Who to contact on other subjects:

Copy for all SELL and WANTED ads For "Ye Old Swap Shop"
To: Mel Comer
205 Roberts Road
Ardmore, PA 19003

Information on Membership, Membership Dues and Club operations to our secretary:

Jim and Barbara Rankin
3445 Adaline Drive
Stow, Ohio 44224

Publication dates for the Gazette:	Deadline for Material
March 31	February 15
June 30	May 15
Septebmer 30	August 15
December 30	November 15

We are working to expand this to six (6) issues per year.

YOUR OFFICERS

President:
Lloyd McIntyre II
4204 Thornapple Lane
Charleston, WV 25313

Vice President:
Ed Lyon
11301 Woodland Way
Myersville, MD 21773

Secretary:
Jim & Barbara Rankin
3445 Adaline Drive
Stow, Ohio 44224

Recording Secretary:
Robert Dickerson
1907 Lynn Lea Road
Louisville, KY 40216

Treasurer:
Ronald Frisbie
312 South 10th Street
Akron, PA 17501

ARCA DIRECTORS

James Troe*
Lloyd McIntyre
Jane & William Denk
John Drake*
Ralph Williams*
John Caperton*
Ralph Muchow*
Ross Smith
Melvin Comer
Lauren Peckham
Rodney Philips
Jimmy Eddington
Lester Rayner
Floyd Bennett
David Manning
Larry Wright
John Terrey
Col. Gilbert Houck
Ed Lyon
Geoffrey Bourne
*Past Presidents

PUBLICATION STAFF

Chuck Crawford • Ronald Frisbie, Color Photographer • Lloyd McIntyre • Patsy McIntyre
Doris Moore • Sandy Underwood • Charlotte Vance
Bob Underwood, Color Scanner Operator

Copyright© 1991 by Antique Radio Club of America, Inc.

Article Directory

PAGE

President's Page - *Lloyd E. McIntyre* 2
A Good Way To Test An Old Speaker - *Larry Babcock* 3
Atwater Kent Radio 4
Where'd I Put That WDII?, Part 2 - *Paul Crum* 5
The WLW 500 KW Transmitter, Part 2
Clyde Haehnle and Ed Dooley 8
Heroes of the Wireless, Part 2 - *Larry Babcock* 12
The Pyramid Scheme - *Robert Lozier* 16
Tesla Coils - *Rodney Schrock* 17
The National SW-3 Receiver - *Reno Ruggere and Jim Troe* 19
Radio: As I Experienced It, Chapter 11
Bullhorns and Upside Down Radio Sets - *Bill Hoy* 24
To Jewelers and Watchmakers - *Mike Feher* 25
Westinghouse Model WR334 Console Radio - *Mike Taylor* 27
Radios and the History of Radio Broadcasting in Hawaii 28
Radio '92 Calendar of Events 36
Special Notice - Membership Dues 39
Reflex Radios - *Ted Babcock* 40
Life Members - New Members 50
Transistor Topics - 1961 GE Model P850-B - *Ross Smith* 51
Radio and Television Pioneers - *David W. Kraeuter* 53
Mel's Corner - *Mel Comer* 56
Swap Shop 58

Coming Issue

Radio Central at River Head N. Y.
Ralph Williams

Radio As I Experienced It, Chapter 12
A Radio In Every Car - *Bill Hoy*

President's Page

By Lloyd E. McIntyre

Looking back over 1991 makes you wonder what we have left to do in 1992. From the Persian Gulf War of Operation Desert Storm to the face-to-face peace talks in Madrid, Spain, there is more to reflect on than one can comprehend.

So true it is of our own society of radio collectors. This has been an outstanding year of meets, meetings, conventions, extravaganzas and conferences. During this time of year, we all need to stop and take inventory of our goals, accomplishments, disappointments and things not yet achieved. Many of us are so busy that we at times cannot enjoy the very thing that we set out to have as our "outlet" for the everyday pressures we face. Our hobby, as simple as it all seemed a few years ago, has grown into a business for many, and a demanding, time-consuming job for others who try to keep all of the different clubs and organizations functioning.

Let's try in the coming year to keep all of this in perspective and enjoy what we have in this very unique group of people.

As we look at our own club, we can see a "wind of change", as many more have become involved in the process. It is hard to believe that with this issue I have had a full year now of responsibility for the **Gazette.** We have so many new people on the staff as editors, writers, and providers of general information that I cannot list them all without the fear of missing someone. To thank all of these people, I am going to leave that up to you, the members, to write a short note to anyone who impressed you this past year with their contribution. This means a lot to someone who put hours of their own time into preparing an article for your enjoyment. If their address is not in the **Gazette,** send the note to me and we will publish it or send it on to them.

Needless to say, you have seen many changes in the **Gazette** this year! Your publication staff is working on a host of other ideas. The one main important ingredient in keeping your magazine innovative, creative and colorful, is your continued personal contributions. To keep your magazine cost-effective, we must continue to increase membership. A great gift idea for a friend who is starting in the radio hobby would be a one year membership. Our membership is at an all time high, thanks in part to everyone who has recruited a new member this year.

I trust you are going to enjoy this special holiday issue as we bring you a picture report from our new Hawaii Chapter. This group has a lot going for it and we are proud to welcome them to our growing family of chapters.

At least one chapter in every state would be a great goal and a tremendous asset to our club. Write to us for information on the formation of a chapter in your area.

I want to apologize to two of our members who did not receive the proper credit on their by-line included with the pictures in Vol. 19 No. 3. On page 24, the very nice Atwater Kent display is that of **RAYMOND THOMPSON** of Fulton, Maryland. On page 36, the Model 67 Zenith belongs to **JOHN DeLORIA** of Chicopee, Massachusetts. Please bring to our attention errors that you notice. We all try to work at this very large undertaking in our spare time and we are not perfect; please help us out. Yours is the only publication for the hobby in color and this requires a very special concentration of efforts.

As we close the year, Patti and I want to extend to you and your family our warmest wishes for a grand Holiday Season and a New Year of health and friendship. We are all so very fortunate to have all the new and old friends this thing called "Radio" has given us. All the wood, plastic, glass and metal would have no meaning without the feelings we all share during the year.

Lloyd McIntrye
President

A Good Way To Test An Old Speaker

By Larry Babcock

Many antique radio collectors carry a small volt/ohmmeter, or just a battery, to test an old speaker before buying it. By just listening for the click you are assured that the driver is neither open nor frozen with rust. You know that the speaker is not completely dead, but you still really don't know how well the speaker will sound.

I have found that an easy way to play music through any old high impedance speaker is to use a small pocket transistor radio or portable tape player to drive the speaker. The only problem is that the tape player's output impedance is around eight ohms whereas the impedance of an old speaker is typically a few thousand ohms. This is perfect! The idea is so simple that you may have already thought of it. Use any ordinary old audio output transformer backwards! Most are designed for a few thousand ohms on the primary and eight ohms on the secondary. Perfect! Turn it around so that the secondary becomes the primary and vice-versa.

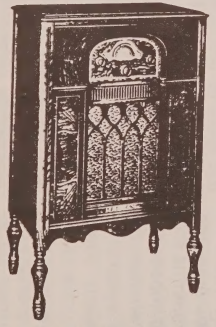
I went a step further and connected a cable and plug to the low impedance winding of the output transformer and clip leads to the high impedance winding. To play a horn speaker, I plug the transformer into my small battery operated tape player and connect the clips to the speaker leads. It works so well that I also use this arrangement to play old time radio tapes through my horn speaker at club meets or at old radio shows. I keep one small transformer wired up for just this purpose.

The idea is not limited to use with horn speakers; any high impedance cone speaker can also be tested in the same manner.

"The Atwater Kent Christmas tree was used in 1931, to advertise the model 80 series (80 thru 89). It was placed in the middle of several A. K. radios on display, with streamers running between the tree and the radios. Note the expression ***Golden Voice,*** which was **later** coined by RCA." — Ray Thompson [Illustration of ad as shown in 1931]

ATWATER KENT RADIO

Golden Values with the Golden Voice



CONSOLE MODEL 85

Lowboy, exquisitely finished in American walnut, with matched butt walnut front panels. Super-heterodyne. Variable-mu tubes and pentode. Tone control. Automatic volume control. Electro-dynamic speaker of advanced design. Quick-vision dial. Antenna adjuster. For use with 60 Cycle—110 Volt A. C. Current.

Complete with tubes $96.00

CONSOLE MODEL 83

Same as above, without automatic volume control. For use with 60 Cycle—110 volt A. C. Current.

Complete with tubes $89.00

CONSOLE MODEL 85-Q

Same as above, for battery operation. Uses the new economical 2-volt tube and air-cell battery. Tone control, and automatic volume control.

Complete with tubes and batteries, $121.00

COMPACT MODEL 82

Gothic arch of distinctive zebra wood. Matched butt walnut panel. Carved twin pilasters. Ornamental grille. Super-heterodyne. Variable-mu tubes and pentode. Tone control. Automatic volume control. Quick-vision dial. Antenna adjuster. For use with 60 Cycle—110 volt A. C. Current.

Complete with tubes $69.80

COMPACT MODEL 82-Q

Same as above, for battery operation. Uses the new economical 2-volt tubes and air-cell battery.

Complete with tubes and batteries . $94.80

COMPACT MODEL 82-D

For direct current. Without automatic volume control.

Complete with tubes $74.80

COMPACT MODEL 80

The Model 80 has a rounded arch of distinctive zebra wood. Matched butt walnut panel. Rope-carved pilasters. Ornamental grille. Super-heterodyne. Variable-mu tubes and pentode. Tone control, but without automatic volume control. Quick-vision dial. Antenna adjuster. For use with 60 Cycle—110 volt A. C. Current.

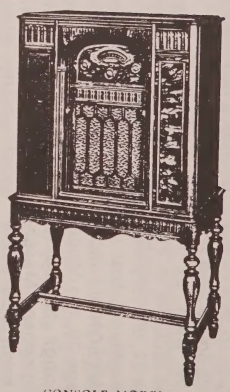
Complete with tubes $62.80

The same chassis used in Model 89 Highboy can also be obtained in the Lowboy cabinet illustrating console Model 85.

Complete with tubes $122.00

The same chassis used in Model 87 Highboy can also be obtained in the Lowboy cabinet illustrating console Model 85.

Complete with tubes $115.00



CONSOLE MODEL 89

Highboy, with sliding doors. Hand-rubbed walnut. Ornamental grille over beautiful dust-tone fabric. Super-heterodyne. Tubes include variable-mus, and two pentodes in push-pull, equivalent to *four* 245's. Automatic volume control. Tone control and static reducer. Quick-vision dial with Atwater Kent compensating device. Antenna adjuster. Electro-dynamic speaker of advanced design. The finest radio that can be built. For use with 60 Cycle—110 volt A. C. Current.

Complete with tubes $132.00

CONSOLE MODEL 87

Same as above, without automatic volume control. For use with 60 Cycle—110 volt A. C. Current.

Complete with tubes $125.00

WHERE'D I PUT THAT WD11?
Organization Of A Private Vacuum Tube Collection
PART II

Paul C. Crum

Early vacuum tube history indicates that attorneys were almost as active in the development of the tube, as engineers. Although basic technical features were protected by patents, numerous manufacturers, mostly small concerns, made these tubes, without benefit of license. Several of these are included in my display. Some bases were imported from Germany, and the elements installed here. Also, various bulb and base configurations were used to circumvent patents. All of these were either stopped, or their makes entered into agreement with the licensees, in some cases for only a stated number of tubes.

The second tube from the right on this shelf, is the UV201A, which came out in 1923, to replace the UV200. Later the UX based UX201A was produced and became the workhorse of most of the "Three dialers" of the period.

The shelf below this one, shows the "dry battery" tubes that brought radio to farms, not yet supplied with electric service. The WD11 — from which this article drew it's name — was the first of these. The WD12 was the same electrically, but had a UV base to replace those sets that were made for the UV based "storage battery" tubes. Due to the internal resistance of dry cell batteries, the amount of current that can be drawn from them is limited. Largely to get around this difficulty, because it was not practical to just keep adding cells in parallel, the UV199 was produced. It was rated at only .06 amperes, and was made to operate from three dry cells in series.

Organization Of A Private Vacuum Tube Collection

In line after it, are a UX199 and a 201A, with the UX base. This became the best known tube in

history. It was used as both a detector and amplifier, and one was even used in many low powered amateur transmitters. The tube at the right end of this shelf, is a UX222, the first screen grid tube; the tube that revolutioned radio frequency amplifiers in receivers, by making possible un-neutralized RF amplifiers, while providing great sensitivity.

Because all audio amplifiers in the early days of radio were operated Class A, the only way to obtain power was by using high plate dissipation tubes, with low plate resistance, to draw greater plate current at given voltages. These were called Power tubes. The first of these was the 112, which is second from the right on the middle shelf. It was followed by the 171, second from the left on the bottom shelf. This tube was used in the audio output stage of even early alternating current radios.

Third and fourth tubes from the left on the bottom shelf, are the 226 and 227 which made practical, "light socket" radios. The 226 was an amplifier tube with a heavy vibration-resistant filament to prevent filament-induced hum. This was used in both audio and RF amplifiers. To reduce the hum to a value required in detector circuits, the 227 was the first indirectly heated cathode, and it is fourth from the left.

Because more power was available from alternating current mains, than from B. batteries, a larger tube, the 210, was developed to operate at a much higher plate voltage. In output tube positions, the 210 was never a great success in this service because it's high plate resistance limited the amount of plate current it drew, and the power it could supply in Class A.

To provide plate voltage for alternating current tubes, the famous 80 rectifier came into use, and was the standard for this service for many years.

With the coming of the electro dynamic speakers and the desire for more bass response that they provided, more audio power was desired. Before the coming of the higher gain pentode output tubes, two other triodes were used. Most common was the 245, which provided power for the boom boom bass, characteristic of that period. It's big brother, the 250 came for higher power services. It was the standard class A modulator tube for early amateur transmitters. A common tube line up for amateur transmitters at that time, was two 210s, operating as modulated self-excited oscillators (feeding the antenna), modulated by a pair of 250s.

The two fifties were also used extensively in PA systems. The earliest mobile amplifier that I remember, used a pair of these, driving a speaker on the roof a Model A two door sedan. Of possible casual interest is the fact that two of these were in the amplifier that fed the trumpet speaker on the roof of WEDC, that Harassed residents of Chicago's southwest side, with sound effects of dog fights and marching bands during un Godly morning hours, as related in the article: This Was Broadcasting, in the fall 1990 ARCA Gazette.

Following its less than spectacular service in Class A audio, the 210 replaced the earlier UV202 triode in low power RF service. They were in thousands of amateur transmitters as self excited oscillators, including the Hartley, Meissner and Tuned Plate Tuned Grid, versions which fed the antenna direct.

A brief resurgence in audio work came when Class B aduio was announced in a 1932 article that claimed an astonishing twenty watts of audio from a pair of two tens.

In my collection, is such a transmitter with a 21C Hartley oscillator mounted on an oak "breadboard" with a large tank coil wound from quarter inch copper tubing, mounted on two genuine procelain beehive insulators and a "Jewell" 50 milliampere meter at the front, to check the loading of the transmitter. A two ten holds court over the other components at the left of the Cardwell tuning condenser.

Two tens were made in a variety of configurations, and were subject to more modifications than Model T Fords, or Grandma's recipe for coconut cake. Gleaming white isolantite bases were used on some two tens, to permit their operation in the five meter "VHF" band, because the tube bases made of other materials used at that time, actually boiled when used with any appreciable power at the "very high frequencies," in this band.

Other modifications were used to make them suitable for VHF use. I have a pair of Triad two tens that were made in 1933, with plate caps at the the top of the tubes to make possible circuit layouts to reduce grid to plate capacitances, and also to permit operation at higher plate voltages.

About that WD11 that I was looking for, and about which this article was named? Organization does pay — I have found it. It is the first tube in the group of dry battery tubes. The one on the left of the middle shelf.

IF YOU CAN ONLY ATTEND ONE MAJOR SHOW IN 92, MAKE IT ARCA-PARS IN JUNE, PITTSBURGH, PA.

The WLW 500 KW Transmitter

PART II

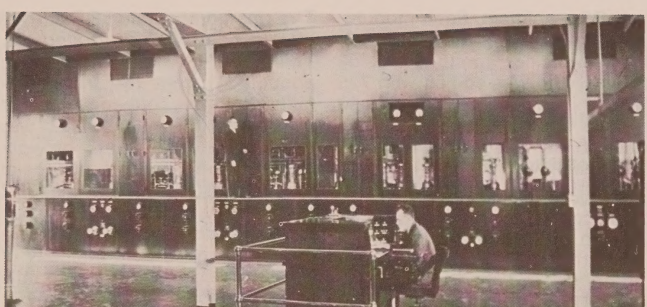
By Clyde Haehnle and Ed Dooley

In the last issue we published Part I of this fascinating story of the most powerful broadcasting station ever constructed and used in the United States. That the equipment was built and the station operated in the 1930s, makes it all the more surprising. The story is here concluded.

The complete transmitter utilized 22 type UV-862, 100 kilowatt tubes, 2 in the 50 kilowatt driver, 12 in the RF amplifiers, and 8 in the modulator. DC generators were required to supply about 3,000 amperes to light the filaments of these tubes. In 1935, the 862's with their antiquated DC filaments were replaced with 898A tubes with three-phase-six-wire filaments. The filaments in these tubes were multi-strands of pure tungsten which could be operated on DC, single-phase, three-phase, or six-phase. The voltage was 28.6 volts phase-to-phase, with a current of 140 amperes or nearly 2.5 kilowatts just to light the filament of each tube. The peak rated emission of each tube was 90 amperes with an amplification factor of 45.

The AC filaments of each 898A required three single-phase high-reactance transformers with a 240 volt primary and a 16.5 volt 140 ampere secondary. The high reactance was needed to limit the start-up current in the cold filaments to 200 amperes. Each transformer was 13" high, 10" wide, and 8" deep, and weighed over 150 pounds. The secondaries were wound with a copper conductor ¾" wide and ¼" thick, wrapped with cotton tape. Sixty of the transformers were mounted on a structural steel bridge in the basement directly under the transmitter cubicles to limit the lead length to the tubes. The weight of the filament transformers alone was almost 5 tons.

Each tube was cooled by a flow of distilled water around the anode at 30 gallons per minute plus 15 cubic feet per minute of air flow on the filament and grid seals. The maximum plate dissipation was 50 kilowatts per tube which represented a 22 degree Fahrenheit rise in water temperature at a 30 gpm rate. The 22 tubes each with 30 gpm of pure distilled water flow required 50 horsepower pumps capable of 660 gpm of flow. A network of 50 feet of 1½" Pyrex pipe for the inlet and outlet of each tube was required to isolate the 15 kilovolt tube anode jacket potential. This was nearly ½ mile of Pyrex pipe. The heated distilled water was pumped through two Westinghouse boiler type heat exchangers which were cooled with 1,500 gallons-per-minute of raw water. The raw water was then pumped outside to a 60 x 60 foot spray pond where the raw water was cooled and recirculated. High temperature water stills were operated continuously to maintain



Inside Transmitter Building

the quality and quantity of the distilled water in the system.

The maximum rating on each tube was 15,000 volts on the plate, 7.5 amperes plate current, and 2.0 amperes of grid current. The rectifier system utilized six 870A mercury arc tubes in a 3-phase-full-wave configuration. Each tube was rated at 15,000 volts, 60 amperes. These tubes required at least 15 minutes of warm-up time before high voltage could be applied. The filaments were single-phase 5 volts at 65 amperes. Frequently these tubes would arc-back. It is estimated that the peak inverse surge current was about 4000 amperes. The local power company and the entire electric network was aware when these tubes experienced an arc-back.

The 33 kv of primary power was fed by the local power company via two separate and independent circuits, one from the east and one from the west of the transmitter location. A sub-station located outside the transmitter building reduced the 33 kv to 2,300 volts which was fed underground to the transmitter building.

The three power transformers each had a 430 kva rating with a 2,300 volt primary and were connected so the primaries could be in a "Y" connection for start-up voltage and "delta" connection for full running voltage. The filter reactor was 0.25 henries at 125 amperes. It weighed 3,190 pounds and was cooled with 160 gallons of oil.

The rectifier provided 12,000 volts at 90 amperes under no modulation. The modulation reactor was 4.5 henries at 60 amperes, weighed 9,500 pounds and was cooled with 525 gallons of oil.

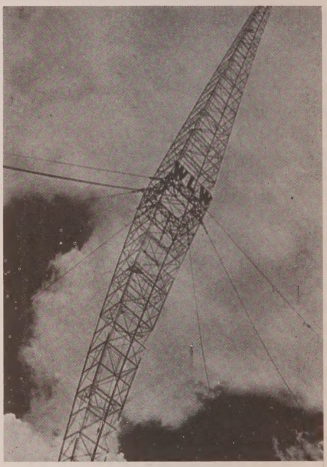
Two modulation transformers were required. Each unit was rated at 180 kva from 30 to 10,000 hertz. The primaries were push-pull, 6,365 volts each side. The secondary was 4,250 volts. The two transformers in series developed 8,500 volts rms to modulate the 12 kilo-

watt RF amplifiers. Each modulation transformer was 8′ high, 6′ wide, and 5′ deep, weighed 35,700 pounds, and was cooled with 725 gallons of oil that weighed 5,450 pounds. That will give you some idea of the size of components being dealt with.

Each time the transmitter was to be placed in operation, a definite start-up procedure was followed. First, the tube filaments were turned on and 30 minutes was allowed to get the ambient temperature in the rectifier cubicle up to 90 degrees F. Then the water flow through each 898A jacket was checked. The 898A filaments were turned on and each filament strand was checked with dark welding goggles. The power transformer primaries were set to the "Y" connection. Next, the 3,000 volt bias supply to the PA units was checked, and each PA unit and each modulator unit was turned on and observed.

The final steps included bringing up the 50 kilowatt drive and checking the tuning on the driver and each of the three PA amplifiers. After a wait of several minutes, the power transformer primary was changed to the "delta connection" and the program modulation was brought up to 50%. The final step was to check the tuning and loading on each PA where the operators had the thrill of dipping the plate current to over 100 amperes.

The output of the transmitter was fed through a harmonic filter to suppress the second harmonic, then into a 100 ohm air-dielectric 10" coaxial line which was custom fabricated from aluminum pipe. The rms unmodulated RF current at this point was 70.7 amperes. The coax line had a length of about 800′ from the transmitter building to the coupling house at the base of the 831′ tower. It was matched through an "L" network to the 390 ohm base impedance of the vertical tower and the 35.7 amperes of RF current was then fed to the base of the tower. This produced an RF field intensity of over 6 volts per meter at one mile from the tower. The 0.5 mv/m contour was 300 miles from the transmitter site. At night, 1 mv or more was consistently measured in Mexico and southern California.



WLW Tower

The single base insulator for the tower supports 110 tons of steel and 340 tons of vertical component of guy pressure for a total of 450 tons. This tower is still in use by

WLW. During the 500 kilowatt operation, a ball gap was provided at the base of the tower for lightning protection. Since this transmitter power was sufficient to sustain an arc once the gap was ionized, a photo-electric cell was utilized to "look" at the gap. If an arc occurred, a high speed breaker would momentarily turn the transmitter off to de-ionize the gap.

Although not directly related to the station operation, General Electric engineers placed special magnetic sensor units on the guy wires. After a lightning strike these units were evaluated. It was estimated from these and other tests that lightning currents of 200,000 amperes were not uncommon.

In 1939, with the FCC ruling limiting the maximum AM station power to 50 kilowatts, the commercial use of the WLW 500 kilowatt transmitter came to an end. However, it was used experimentally each night after midnight with call letters W8XO from 1939 to 1943 when it was shut down permanently. One of the purposes of this experimental operation was to keep the transmitter in good working order to reach a large percentage of the population in case of a national emergency during this wartime period.

When the 500 kilowatt transmitter was shut down permanently, Mr. Crosley lost interest in broadcasting and turned his attention to other pursuits such as facsimile, manufacturing of appliances, and production of small automobiles with aluminum engines. In 1945, the broadcast stations and manufacturing facilities were sold to the Aviation Corporation (AVCO). He retained ownership of the automobile plant and the Cincinnati Reds baseball team.

Following the 1939 FCC 50 kilowatt ruling, the 24 stations authorized to operate on "clear channels" in this country organized a group to perpetuate the concept of nighttime clear channel stations and to seek a change in the rules to permit powers greater than 50 kilowatts for these stations. At one point, a maximum power of 1,000 kilowatts was proposed. One of the reasons for seeking an increase in power was to offset the increase in man-made noise resulting from the use of electrical appliances, but the major reason was to provide nighttime skywave service to vast areas of the United States which had no reliable nighttime AM reception.

In 1946, the FCC initiated hearings to determine the future course of AM allocations and particularly the clear channel stations. These hearings, designated Docket 6741, would continue for many years. In 1960, the FCC reopened the still unresolved case and proposed to breakdown at least some of the clear channels by permitting additional 50 kilowatt stations on these frequencies including WLW's 700 kilohertz as a means of providing nighttime coverage to the unserved "white areas" of the country. WLW joined the other clear channel stations in not only opposing this proposal, but showing that a much better means of providing nighttime white area coverage would be to maintain the clear channel concept and to permit the clear channel stations to increase power to 1,000 kilowatts.

In 1960, as convincing as these arguments were thought to be from a technical standpoint, the broadcast business was changing and time had worked against the clear channel AM stations. Television and FM had also become a major factor by this time. So, although the technical arguments were sound, other factors prevailed, and the FCC permitted additional stations to start operating on some of the clear channel frequencies and the long quest for high power AM radio died. An exciting period in the history of broadcasting had come to an end.

Clyde G. Haehnle graduated from the University of Cincinnati with a degree of Electrical Engineer. He joined the Crosley Radio Corporation, and its successor, AVCO Broadcasting Corporation in 1941, and was involved in the experimental operation of the 500 kilowatt transmitter. He later became an engineering Vice President and Executive Assistant to the President of AVCO Broadcasting Corporation until AVCO sold its broadcast interests in 1976. Mr. Haehnle is now Executive Vice President of R. C. Crisler & Company, a station brokerage firm in Cincinnati.

Edwin B. Dooley graduated from the University of Cincinnati with a degree of Electrical Engineer. He joined the AVCO Broadcasting Corporation and its successor, Multimedia Broadcasting Company, in 1956. From 1963 to 1987 he was chief engineer of WLWT television in Cincinnati. Mr. Dooley is presently a broadcast engineering consultant in Cincinnati.

Heroes of the Wireless

PART II

By Larry Babcock

Another sea disaster occurred one February evening when the steamship FLORIZEL struck Horn Reef on a routine trip from New York to Newfoundland. The senior Marconi operator, Cecil Carter, was on duty while Murphy, his assistant, piped down. At 2 A.M. Murphy took over the watch and Cecil turned in. Just as he went to sleep there was a heavy crash followed by a second still harder one. Murphy started the generator while Cecil ran to the wireless cabin and began sending out the S.O.S. While operating the wireless he was being violently thrown from side to side in the wireless cabin. Soon Murphy got the ship's position from the Captain and the message became, "S.O.S. Near Cape Race, fast going to pieces."

These first signals were sent out at 4:45 A.M. on ship's power. When the lights went out the operator switched to auxiliary and was able to send for about another five minutes. Then a large wave struck the wireless cabin, swamped the storage cells and put the whole set out of operation. A few seconds later the topmasts and aerial were down and the operators left the wireless cabin. Wave crests were breaking over the wireless room even though it was one of the

highest shelters on the ship. The decks were swamped, and the lifeboats smashed over the side and flew away!

About a half hour later someone suggested going back into the wireless cabin. It had withstood a lot of battering, probably because it was made of steel and was elevated. More people kept coming in and the room filled up rapidly, since it was only 7x8 feet in size. One of the last stragglers brought the information that the bridge, Captain's room and the smoking room had been swept away. It was later learned that these accidents resulted in the loss of fifty souls, swept to eternity.

Finally the storm abated somewhat and the cabin occupants began to notice their surroundings. About forty wet persons were crammed into a space of 7x8 ft. Many were half-clothed. The roof was leaking and the sea was still coming in. Some had broken limbs and the third mate had his face badly bruised, but no one complained. With the coming of daylight people could be seen on the shore line but they were helpless to bring aid because of the storm. The crew tried to lower one lifeboat which the storm had spared, but it capsized and the attempt was abandoned. Finally, towards evening, the occupants cheered when they saw two steamers on the horizon heading toward them. Unfortunately evening drew in quickly and the rescue craft pulled away for the night. It was later learned that the rescue steamers thought there were only four persons left on board. During the second night in the cabin the occupants began to suffer from hunger and thirst. No water was available.

Two of the survivors were women. They were clad only in night dresses over which they had flung thin jackets when they left their cabins. This gave them small protection in the small cabin from which the door was gone, after being ripped off by a wave.

The men were able to solace themselves a bit with some tobacco but of course even this small comfort was denied the two women. The next afternoon one man died and his body was placed outside on the deck where it was soon removed by the stormy sea. This poor man was a soldier who had lost his wife and child earlier the same day. The third night some of the survivors attempted to sing hymns and other religious songs. This raised everyone's spirits a little and helped to pass the time.

About 2 A.M. a well lighted ship was seen and some survivors attempted to communicate with them using flashlights. In this manner they learned that the rescue ships were surprised to hear the number of survivors crowded into the small wireless cabin. The rescue ship said that they had attempted to launch a boat but it had capsized.

At daybreak the seas were still very high but the work of rescue was begun. A jolly boat was anchored a few yards from the FLORIZEL. A line was then passed to the wireless house so that small boats as they approached could maintain their positions in the rough water. Survivors had to make a jump for it. If they landed

in the rescue dories they were lucky. Those who missed received a very cold plunge!

On the rescue ships, survivors were given warm blankets and fed. Injured members received emergency treatment. Ninety-four persons lost their lives in the FLORIZEL disaster. Forty two persons were saved. Of them thirty-seven owed their lives to the sturdy little wireless room where they had taken refuge on the wrecked steamship. Among the officers lost was the chief engineer and the second mate.

No story of wireless heros would be complete without inclusion of the story of the loss of the TITANIC. This most appalling of all sea disasters must always recall the heroic sacrifice of her wireless man, Jack Phillips. He had complete faith in his ship, but even when he finally found himself face to face with death, he kept his courage and stayed at his post.

The night of the disaster found Phillips completely tired out. The wireless had broken down and Phillips had worked without interruption for seven hours. Imagine what might have happened if he had neglected the work or been unable to make the repairs! Perhaps the TITANIC's fate would have remained a mystery forever! Phillips' watch normally ended at midnight but his assistant, Harold Bride, knowing that Phillips was tired, offered to relieve him early. The wireless cabin on the TITANIC contained three rooms — a sleeping room, dynamo room and operating room. Bride stepped into the operating room without taking the time to dress.

Phillips was receiving a message and Bride, standing beside him, was urging him to go to bed at the time of the collision. The shock of the impact was very slight and the operators continued their conversation as though nothing had happened. A few minutes later the captain came to the wireless room and said that the TITANIC had struck an iceberg and an inspection was being made to determine the damage. He told them to prepare to send out a call for assistance. His order was thought to be routine. Neither operator was the least disturbed. Ten minutes later the captain was again at the wireless cabin. The operators could hear the sound of confusion on deck but the captain appeared perfectly calm. No one realized the danger of the situation. The wireless was working perfectly.

"Send out the call for assistance," said the captain.

"Which call, Captain?" Phillips asked.

"The regulation international call for help," the captain said, then hurried away. The C.Q.D. (Distress Call) was instantly flashed out with the full power of the apparatus, which was the most powerful then afloat. This continued for five minutes with no response when the captain again appeared.

"What are you sending?" he asked.

"C.Q.D." Phillips replied.

"Send out the S.O.S." said the captain. The call for help then became, "C.Q.D. S.O.S. Rush-rush. Titanic."

The accident was still not considered to be very serious. The big ship was known to be taking water

but it was inconceivable that she was in any real danger. The FRANKFURT was the first to answer the call for help. Phillips told her that the TITANIC had struck an iceberg, gave the exact position and asked for assistance. It was still thought that the only assistance needed might be for passengers who wanted to be taken off to reach port more quickly.

The TITANIC was beginning to sink a little when the CARPATHIA radioed that she had put about and was headed full speed for the TITANIC. Bride rushed to tell the captain. The decks were crowded with excited passengers. When Bride returned to the wireless cabin Phillips was calmly transmitting detailed information to the CARPATHIA. He turned and told Bride to put on his clothes. Bride had completely forgotten that he was not dressed!

Bride continued to carry messages to the captain informing him of the CARPATHIA's speed and position. The first lifeboats had been filled with women and children and were being lowered over the side. The list forward continued to increase.

A little later the captain gave the information that the engine room was filling and the dynamos would not last much longer. This was relayed to the CARPATHIA.

With the upper deck almost awash and fifteen hundred passengers and crew still on board, Bride thought of his life-belt and returned to the wireless cabin for it. There he found Phillips still sending, this time to the OLYMPIC.

At this time the captain told the wireless men that they had done their duty and to abandon ship. Phillips continued sending for ten more minutes. Bride shouted a warning to him and left. This was the last time that he saw Phillips alive.

At dawn it was discovered that several whom the CARPATHIA had pulled from the water after the TITANIC sank had died during the night. One was Jack Phillips. He had died of exposure before help came. The CARPATHIA was 56 miles away when she received the first S.O.S. message. Ironically the CALIFORNIAN was only a few miles away from the TITANIC at this time but her wireless operator was asleep. Investigations of the tragedy led to strict rules of safety at sea and to iceberg patrols.

The TITANIC disaster occurred April 15, 1912 with a loss of over 1,500 lives. (About 700 were saved) She was the largest ship afloat and considered unsinkable. This was her maiden voyage.

This story gives some idea of how very valuable wireless was to ships at sea and of the bravery of the men who operated the radios, the heroes of the wireless. Indeed radio did not start with the broadcast era. It served a very important function at a much earlier time. In 1912, by using ships as stepping stones, a wireless message could circle the earth in forty minutes and it was said that wireless should be considered number one among the seven wonders of the modern world.

Ref.: "The Wireless Man" by Francis A. Collins, October 1912.

The Wireless Age, August 1918.

The Pyramid Scheme

Here is my story on the most complicated trade I have made to date . . . .

One Saturday about a year and a half ago, some friends and I were making our way around a favorite fleamarket. We paused at a table to look at some bakelite cased radios sitting on an old folding card table. I happened to kick a cardboard box under the table just enough to make me glance down at it. The box was colored gray and black and said ZENITH RADIO NURSE!!! We were all familiar with this outfit but managed to keep our poker faces. The dealer wanted $15 for the boxfull and it was 'real easy for me to whip out the cash'.

Later, inspection showed that the Radio Nurse and the companion transmitter had probably never been used because there were none of the little tell-tale drops of wax frozen to the low points of the coupling and bypass capacitors, etc.

Well . . . This is a real neat item but I just don't think that it needs to be in my collection of broadcast receivers . . . So, what to do??? . . .

Maybe you have heard of the "Volksempfaenger" (Peoples Receiver) that were produced in Nazi Germany during the 1930's. I was aware that there was a similar, but not nearly as successful, program undertaken in Fascist Italy. I wanted very much to have all three of the receiver types made under that program.

I have a friend in Italy with whom I trade radios on a regular basis . . . I asked him if he was aware of anyone that might consider a trade for a peoples radio called RADIO BALILLA . . . He thought that if I had an Atwater Kent breadboard receiver to offer he might be able to 'knock one loose'.

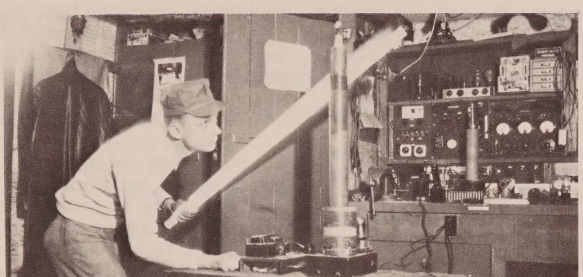
So, I had to find a breadboard . . . I have two in my collection but have no intention of letting them go. The first person that I thought to call was Harry Poster up in New Jersey since I had seen his ads many times for the Radio Nurse. Harry said to give him a week to come up with a breadboard . . . sure enough, Harry found a dirty but otherwise OK Model 10c that I was sure would be good trading material. So we made a swap via UPS.

Then I shipped the breadboard to Franzoni in Italy. Franzoni went to work over there to find a collector that wanted the breadboard enough to part with the RADIO BALILLA. I must tell you that Vic has awesome powers of negotiation and he could probably sell snow cones outside during a blizzard!!! He worked his magic and sent me the set I wanted in the next shipment.

The whole transaction required about nine months and six separate shipments. What, I ask you, could be easier!!!

Robert Lozier, 600 E. Green St., Monroe, NC 28112

The first network broadcast from the Metropolitan Opera House was Hansel and Gretel, broadcast on Christmas day 1931.



RODNEY SCHROCK, a man of science, at work in his 1949 laboratory

TESLA COILS

By Rodney Schrock

Many an early radio experimenter found himself intrigued with Tesla Coils. They used radio components. They "radiated" energy. They were "science". They sure were great to impress people with.

So, what is a Tesla Coil? Basically it consists of a radio frequency oscillator of relatively low power, with the output connected to a radio frequency step up transformer to develop extremely high radio frequency voltages. Off the secondary one could develop great sparks (lightning!), turn on light bulbs without direct contact, make one's hair stand straight up, and otherwise perform as a man of science and a magician.

In 1949, having delved into many other marvels of radio, I turned my attention to Tesla Coils. For many years I had saved a copy of *Popular Science* which included an article on a "Cigar Box Tesla Coil". It was now time to build it. I began with the important first step of being sure that I had all of the specified parts, a cardboard shipping tube, a Mother's Oats box, a cigar box, the correct size wire, and the necessary radio parts for the oscillator, including the two type 10 radio tubes called for.

Following the instructions, I coated the shipping tube with paraffin, and then proceeded to wind the 21 inch long secondary coil with No. 30 cotton covered wire. The wire may not have been exactly No. 30. I unwound it off an old solenoid I found in the high school physics lab wastebasket. In the winding of this long coil I surely would have developed "coil winders thumb", a groove in the skin, if I had not remembered from an earlier painful experience to wear gloves. For the oscillator primary and tickler coils, I used waxed door bell wire.

Assembling the coil was routine. For the filament and plate voltages, I used an old radio power transformer.

It was a pretty simple job for an experienced radio man like me. However, on first try, the thing didn't work. I couldn't find any problem, so I wrote the editor of *Popular Science,* and even though the article had appeared many years before, he sent me a nice long letter telling me about all of the things to try. Nothing helped. In the process of trying everything, I removed the top insulator from the high voltage secondary coil, pulled the end of the secondary winding wire out of the top of the high voltage coil, tried it again, and due to some law of science unknown to me, it worked like "gangbusters".

Sometime later, I built a second Tesla Coil, based on an article in a 1935 issue of *Popular Science* that I found in a garage. In this version, the radio oscillator was a Model T Ford spark coil.

This unit worked best when the spark gap was adjusted to cause the spark gap to break down several times per second. This caused the unit to operate at a relatively low radio frequency. This unit could deliver painful shocks. In one experiment, I held a plastic handled screwdriver close to the high voltage end of the secondary. The arc to the screwdriver broke down the handle insultation, and got me a good one in the thumb.

With each of these coils I went through the usual selection of experiments . . . lighting fluorescent lights, exploding flash bulbs, developing corona discharges that would go through glass, and cause standard light bulbs to glow strangely. My audience was always impressed, or so I liked to believe.

But the novelty ran thin, and I ran out of people to demonstrate my vast knowledge to. In addition, I was worried about the prolific radiation of radio noise that these devices create, and I didn't want another run in with the FCC! So my great tesla coils were put in storage, and I went back to my real love, radio, where I have remained ever since.

Editors Note: Information, plans, and kits of parts for modern Tesla Coils can be obtained from Information Unlimited, Box 716, Amherst, NH 03031.

The rapid expansion of mobile cellular telephones has made common the "thru the glass" antenna seen mounted on the the rear window of many cars. This recent antenna design innovation has eliminated the need to drill holes in cars to install an antenna. Recent innovation? In September 1923 Radio News there is an article showing how to glue one-foot squares of tinfoil to each side of a window, connect the antenna to the outside foil and the set to the inside foil, thus eliminating the need to bring the lead-in thru a partially opened window. Progress indeed!

The NATIONAL SW-3 RECEIVER and its baffling coils

by Reno Ruggere N3FPY and Jim Troe W2GRX

The National SW-3 receiver was introduced in 1931. It was not the third shortwave receiver designed by National; the 3 refers to 3 tubes. An important predecessor receiver for this story was the SW-4 (4 tubes). It was designed by RCA and manufactured in very limited quantities by Westinghouse and National over its short life, and primarily used by the airlines. The SW-4 was not successful due to the fact that performance varied a great deal depending on humidity.

It was eventually determined by Radio Frequency Laboratories, in Boonton, New Jersey that the main problem was in the coil forms. They were made of bakelite with wood flour filler that was very hygroscopic. The Boonton Rubber Company (see the story, "The Early Radio History of Northern New Jersey" that has been running, serialized, in the Gazette) developed a material using ground mica as a filler that resulted in coil forms that were of much higher Q and were constant in their characteristics. National called the material R-39 and used it widely in their advertising.

The design of the SW-3 started in the late 1920s with the objective of turning out a commercial amateur receiver of high quality, with the exception that it would also be used commercially by the airlines and others. National used the new R-39 based coils with the SW-3. The SW-3 was probably one of the most popular communication receivers ever made. It remained in production until the mid 1940s, a span of at least 14 years. Over 10,000 sets were manufactured.

During this time, three major different versions of the SW-3 were manufactured. Tube types were changed, and other changes made to keep up with the state of the art. Since the SW-3 used many coils to cover the full general coverage and band spread ranges, and since the coil design changed between models, there were a very large number of different coils produced.

SW-3 coils can be recognized because they all use a 6 pin base with an odd pin spacing that does not match any tube socket pin pattern. However, the same coil form was used by National for coils for the SW-5 and possibly some other sets. It is difficult to match a given coil to the specific model of the SW-3 for which it was made. The SW-3 is a relatively scarce receiver today, and is diligently sought by collectors of early communication receivers. The coils, it seems, are even rarer, and seldom found properly matched to the set.

Following is information to help the collector recognize which model of the SW-3 he has, and to pair up the proper coils with the set. It is entirely possible to modify or rewind a coil designed for one model of the SW-3 or the SW-5, to convert it to match the SW-3 model of interest. That information is

beyond the scope of this article. There is a lot of valuable information relative to modifying coils in reference 6 below. Reference 1 includes detailed winding information for amateur-band bandspread coils for the first model of the SW-3.

The SW-3 is a 3 stage radio, using an rf amplifier, a regenerative detector, and one stage of audio driving a headphone jack. Therefore, the set used two coils for each band. The general purpose coils are interchangeable between the RF Amplifier and the Detector, except as noted below. The amateur-band bandspread coils are not interchangeable. The coil with a trimmer capacitor inside must be placed in the detector coil socket.

But first, let us try to identify the vintage of an SW-3. The following has been obtained by review of the references below, SW-3 instruction manuals, National catalogs, and advertising material.

The tube lineups are many. The SW-3 was sold in at least the following combinations:

Model 1 (introduced in 1931)
Uses early color-coded coils or later 10 and 20 series coils.

	RF	DET	AUDIO
Version 1	235	235	227
2	236	236	237
3	32	32	30

Model 2 (introduced in 1936 — These seem to be the most common today)
Uses 60 and 70 series coils.

58	58	27
58	58	56
6C6	6C6	76
6D6	6D6	76

Model 3 (introduced in 1941)
Uses 30 and 40 series coils.

6J7	6J7	6C5
1N5	1N5	1A5

The coil sets that pair up with the models above are here summarized:

Coil Range in Meters			Model 1	Model 2	Model 3
9 to 15	10	brown		60	30
14 to 25	11	black		61	31
23 to 41	12	red		62	32
40 to 70	13	white		63	33
65 to 115	14	green		64	34
115 to 200	15	blue		65	35
200 to 360	16	orange		66	36
350 to 550	17	yellow		67	37
500 to 850	18	purple		68	38
850 to 1200	19			69	39
1200 to 1500	20			70	40
1500 to 2000	21			71	41
2000 to 3000	22			72	42
Bandspread					
10 meters	10A	brown		60A	30A
20	11A	black		61A	31A
40	13A	white		63A	33A
80	14A	green		64A	34A
160	15A	blue		65A	35A

Notes:

1. Low frequency coils (19-22) will probably not work in early Model 1 sets.
2. Sets 36, 37, 38, and 42 are not interchangeable between Detector and RF. Look for "D" or "R" on bottom outside of form near prongs.
3. In bandspread coils, coil with internal trimmer capacitor must go in detector coil socket.
4. Coils were color coded when SW-3 was first introduced. Then coils were changed to number series.
5. The color coded coils have the color printed in a groove on the top of the coil.
6. The number of a coil is hot-stamped on the form.

If one traces out the wiring of an unknown SW-3 in order to determine the vintage of the set, it is important to remember that many sets were modified by their owner. Early superhet receivers had no RF stage. QST published articles showing how to convert the SW-3 into a preselector to be used in front of these early superhets to improve sensitivity and the image ratio. Thousands of SW-3s were probably so modified. (See QST, March 1935)

For those of you who want to wind your own SW3 coils, it is timely that James Fred is now making and selling coil forms for the SW3, with the correct pin spacing. He has just announced that they are available from him for $7.50 each, plus $2.00 per order for shipping. (R1, Box 41, Cutler, IN 46920)

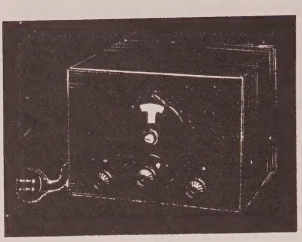
Mr. Fred also sells SW-3 coil winding data, 16 pages of complete coil winding information, with drawings. Free with a $50 coil order, or $5.00 plus $1.50 for shipping.

Anyone who has an SW-3 that he intends to work on should obtain the following references. They have a wealth of detailed information on the various versions of the SW-3, including schematics. We have used them all in preparing the above material.

References:

1. *"A Combination AC and DC Amateur Band Receiver"*, James Millen, QST, September, 1931
2. *"Revising Amateur Tuner Design"*, Robert Kruse, QST, January, 1931
3. National ads in QST in the 1930s
4. National instruction manuals for the SW-3
5. *"The Year is 1931. National Radio Introduces the SW-3 All-Wave Receiver"*, William Orr, CQ, July, 1971
6. *"The National SW-3 Receiver Revisited"*, William Orr, CQ, February 1978.
7. *"The SW-5"*, John Nagle, CQ, November, 1978

ARCA-PARS NATIONAL CONVENTION PITTSBURGH, PA JUNE 1992



1931-2

NATIONAL

DOUBLE SCREEN GRID
3-TUBE THRILL BOX—Type SW3
AC AND 6-VOLT DC MODELS

The sensitivity of the SW3 is so great that the push-pull stage is seldom, if ever, used when the receiver is being employed in amateur communication work or by expeditions for maintaining contact with their base stations. The SW3 Thrill Box employs the same circuit, and all other essential features, as the famous SW5, except for a more compact layout and the elimination of the last or push-pull stage. It is designed especially for aircraft, portable, and amateur communication use.

A highly desirable feature found only in this receiver is the calibrated volume control, which thus serves as an audibility meter. As standard equipment, the SW3 amateur receiver is furnished with the three sets of band spread coils for the 20, 40 and 80 meter bands. For reception on other frequencies it is necessary to secure the additional coils listed under the SW5. Coils designed for either the SW3 or SW5 are interchangeable.

The AC model uses the new UY 235 variable MU tetrode in the RF and detector circuits and the UY 227 in the first audio circuit.

The DC model uses the new UY 236 and UY 237 6 volt low current tubes. This latter model can, therefore, be operated from a filament transformer and B batteries, or a filament transformer and B eliminator if desired, thus making it a universal AC or Battery Model. For strictly AC operation, however, the AC model in conjunction with the 5880 power unit is to be preferred.

COMPLETE PARTS

Catalog Symbol	*Name of Parts*	*List Price*
ACSW3	NATIONAL complete set of parts for 3-tube Short Wave Thrill Box—with band spread coils—less tubes—wired by the Jackson Research Laboratories	$55.00

Note: The above price is for either AC or DC models.

When DC Battery model is desired, specify Catalog Symbol as DCSW3.

NOTE: The circuit employed in the NATIONAL Thrill Boxes, described above and on the opposite page, will give less background noise and a lower noise level than any other type of shortwave circuit. There is less cracking, less hum, and less interference with reception of broadcasts or signals.

R. F. transformer coil forms are molded of "R-39", the new low-loss material developed by the Radio Frequency Laboratories especially for the NATIONAL COMPANY.

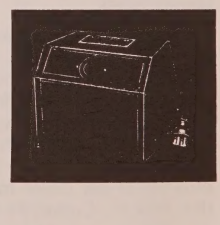
National Power Units for AC Short Wave Reception

One of the essentials for humless AC Short Wave reception is the use of a power unit designed especially for that purpose. NATIONAL power packs have an exceedingly low inherent hum, employing a double section filter using good quality chokes and plenty of condenser capacity. The power transformer has an electrostatic shield between the primary and other windings in order to prevent line disturbances from getting into the power unit and into the Thrill Box.

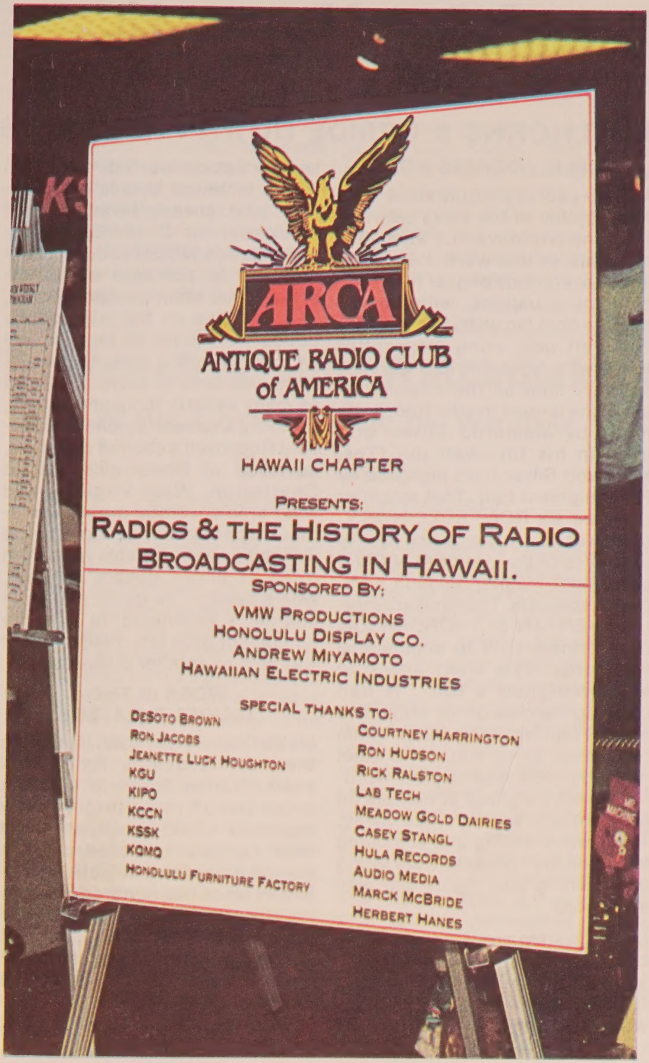
A special R.F. filter, located between the 280 rectifier tube and the hum filter is a feature of all NATIONAL power packs designed for short wave use and is one of several important factors contributing to the complete elimination of so-called "tunable hums", frequently encountered in short wave reception.

Catalog Symbol	*Description*	*List Price*
5880-AB	Completely wired power supply for use with the ACSW5 Thrill Box using the '27 tubes in the output stage on 105-120 volts, 50-60 cycle current supply. Less tube	$34.50
5880-AB-25	Completely wired power supply for use with the ACSW5 Thrill Box using the '27 tubes in the output stage on 105-120 volts, 25-40 cycle current supply. Less Tube	39.50
5880-AB-220	Completely wired power supply for use with the ACSW5 Thrill Box using the '27 tubes in the output stage on 220-230 volts, 50-60 cycle current supply. Less tube	37.00
5880-AB-S	Completely wired power supply for use with the ACSW45 Thrill Box using the '45 tubes in the output stage on 105-120 volts, 50-60 cycle current supply. Less tube	39.50
5880-AB-S25	Completely wired power supply for use with the ACSW45 Thrill Box using the '45 tubes in the output stage on 105-120 volts, 25-40 cycle current supply. Less tube	42.50
5580-AB-S220	Completely wired power supply for use with the ACSW45 Thrill Box using the '45 tubes in the output stage on 220-230 volts, 50-60 cycle current supply. Less tube	39.50

We have designed special power packs for use with the NATIONAL Short Wave Thrill Boxes on the different current supplies available in various sections of the United States and in foreign countries, as listed at left:



All NATIONAL Power Units are licensed under RCA patents.


ARCA
ANTIQUE RADIO CLUB
of AMERICA
HAWAII CHAPTER
PRESENTS:
RADIOS & THE HISTORY OF RADIO
BROADCASTING IN HAWAII.
SPONSORED BY:
VMW PRODUCTIONS
HONOLULU DISPLAY CO.
ANDREW MIYAMOTO
HAWAIIAN ELECTRIC INDUSTRIES
SPECIAL THANKS TO:
DESOTO BROWN
RON JACOBS
JEANETTE LUCK HOUGHTON
KGU
KIPO
KCCN
KSSK
KQMQ
HONOLULU FURNITURE FACTORY
COURTNEY HARRINGTON
RON HUDSON
RICK RALSTON
LAB TECH
MEADOW GOLD DAIRIES
CASEY STANGL
HULA RECORDS
AUDIO MEDIA
MARCK MCBRIDE
HERBERT HANES

Radio: As I Experienced It

Chapter Eleven

By Bill Hoy

BULLHORNS & UPSIDE DOWN RADIO SETS

PUBLIC ADDRESS WORK

Public-address equipment was very popular in the years between 1933 and World War II. I went after my share of that work. I accumulated several sets of gear for use in different situations, with power-outputs from ten watts to a monster 200 watt unit using transmitter tubes with 1100 Volt DC on their plates. I built all the amplifiers I used, the largest mostly from parts made by McMurdo Silver, and used in his fifty-watt job (Yes, McMurdo Silver built high-quality PA equipment too). That amplifier powered six RCA "BULL HORN" speakers, those were early examples of the use of ALNICO-5 permanent-magnet fields in high-power speakers. The smaller amps. used KENYAN or THORDARSON transformers built to commercial standards. The most powerful amp "weighed a ton". It had carrying handles on its ends, and was a top two-man load. While tests were being run, on a quiet night, speech was copied word-for-word by a group of hunters on a mountain seven miles away. There was a saying that you could tell when my speakers were going by watching your lights dim with each word!

My PA system operated, under the business-name "TOWN CRIER", indoors and out, and mobile or fixed. All equipment used outdoors was weather-proof. When my service was contracted, I attended to the technical details of operation, and always hired a relief announcer for Charleston, W.Va. radio station WOBU to do the talking, and to act as a master-of-ceremonies when needed. I could, and did, take on the microphone duties from time to time so my announcer could rest. My equipment was used to serve groups of as many as forty thousand people, covering a speech by one of President Roosevelt's cabinet members, coverage of Roosevelt's visit to Charleston, West Virginia, and wide-area coverage during world-class speedboat racing on the Kanawha river. My rates were from three to fifteen dollars an hour, with a twenty-five dollar minimum charge. I continued to use the equipment until late 1946, when it was sold to another business.

WORK IN THE TALKIES THEATERS

Movie theaters had been improving their sound quality for several years, Warner Brothers began a program of installing greatly improved sound-equipment in all their theaters. I latched on to a sub-contract for that work, travelling as far as two hundred miles, to install that new equipment. I still have a JENSEN loudspeaker I salvaged from a twenty-four-speaker baffle behind the screen of one of those theaters.

The installation work led to the

conclusion that motion picture theaters needed repairs to equipment, and I was qualified to do the work. That resulted in much extra income, and an agreement with a chain of seventy-eight medium sized (three hundred-to-seven hundred-seat) theaters to do all their sound, and projector repair-work. The shop was located in the basement of one of their theaters. I continued to do all their work until the theater burned, destroying all my equipment, in 1945 while I was in military service. I met my wife-to-be while I was making repairs in a theater projection-room.

RADIO SOUND IMPROVES

Radio owners were frequent movie-goers. They noticed that movies had much better sound quality, especially on music, than the best radios on sale in the stores. Their complaints led to better sound-quality for radio sets, but the movie sound has never been equaled.

(Continued on page 29)

To Jewelers and Watchmakers

Get the Correct Time by Wireless Twice Daily

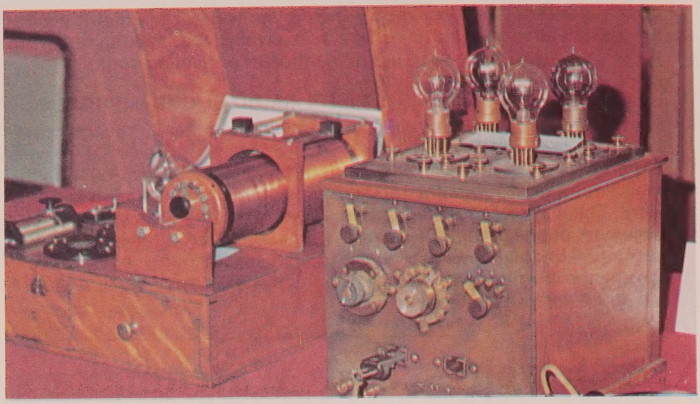
WIRELESS STANDARD TIME SET

The F. B. Chambers set, as it appeared in one of their early catalogs, was offered with either a crystal or audion detector. Mine as you know is the audion type. I expect it is around 1913 vintage. The lid locks with a key and when the lid is down the little drawer also locks automatically. The Ant/Gnd, earphone and battery connections are via the bayonet sockets on the side and the front. The loose coupler is identical to the very common F. B. Chambers small coupler. By common, I mean typical of Chambers manufacture; in reality, they are very scarce today. From what I have seen so far I am led to believe that Chambers never made any two sets alike. While there are not many around to compare, it does seem that they were all individually made. Bruce Kelley was visiting here last weekend and he shared the same comment regarding Chambers equipment.

There is not much to tell about the French Detector/Amplifier combination. The set was intended to be used with external loose coupler type tuning circuit. The switches on the front allow the operator to select 1 to 4 stages of audio amplification. I expect it is around WWI vintage and it uses four "R" valves. The crystal detector is on top in the very front. The set was manufactured by J. Boudenein of Paris. The tube sockets are removable and can be re-inserted upside down, with the tubes in them, for transport.

Mike B. Feher, Manassas, VA 22110

(See picture on page 26)



A Wireless Receiving Set, Designed Especially for Jewelers and Manufacturers of Accurate Timepieces

Another scene from Radios and The History of Radio Broadcasting in Hawaii Display.

Westinghouse Model WR334 Console Radio

by Mike Taylor

When I saw the photograph of a McMurdo Silver Masterpiece V on the cover of the Summer 1991 Gazette, I was amazed at how similar it looks to a radio in my collection. My set, a Westinghouse Model WR334, stands 43 inches tall, and is 23 inches wide by 15 inches deep. It has a twelve-tube chassis and tunes from 540kHz to 19MHz in three bands. It boasts separate bass and treble tone controls, and an AFC on/off switch.

The band switch position and the AFC status are shown by lighted indicators on either side of the tuning scale. The tuning control is of the concentric type usually found on these radios, with a large outer knob for coarse tuning and a smaller inner knob for fine tuning.

This receiver is essentially in "as found" condition. I don't believe in refinishing a set unless it is really wrecked, but I did give the cabinet a good "feeding" with linseed oil and turpentine mixed 50/50. The grill cloth is a bit ragged, but it is so unusual (perhaps unique) that I feel it would be a mistake to replace it with any other pattern.

The main problem I had in getting the set operational was freeing the tuning drive mechanism, a shaft-within-a-shaft type of arrangement, which had seized because of the near-solidification of the lubricants within the assembly.

I almost decided not to go look at this radio. When the person selling it described it over the telephone as a "large '40's-style console radio," I pictured one of those horizontal radio-phonograph combinations. Obviously, I'm glad that I "checked it out."

— Michael F. Taylor, 225 North Adlena Drive, Fullerton, CA 92633

Radios and the History of Radio Broadcasting in Hawaii

Presented by "The Hawaii Chapter" of **"The Antique Radio Club of America".**

The format is made up of multi media sets depicting the following subjects:

1. "Remember Pearl Harbor". Selections of Pearl Harbor Memorabilia from the Gene Sawyer Collection, along with selected radios from the George Krater Collection.
2. 20's-30's Living Room, featuring: large console radios, mannikin dressed in era clothing amidst console radios, early radios, Cathederal and Tombstone radios, a number of small wood horizontal radios, song sheets and pictorial history of the first lady of radio in Hawaii, Gene Sawyer, and the first family of radio in Hawaii, the Harry Soria lineage.
3. "The Voice of Hawaii". KGU's earliest history dipicted by a pictorial history of the Soria family, 1922-1941.
4. "Hawaii Call" set — Pictorials and Mannikin portrayal. Original program played on DAT reproduction. Courtesy of Hula Records. "Playbill" of KCCN Hawaiian Radio.
5. "Big Bands" set — movie posters, album covers, other pictorials. Vignette of KIPO Jazz Programming. 30's-40's Streamlined & Art Deco Bakelites.
6. "Moo City Diner" — Photo Opportunity set of 50's diner front, courtesy of Meadow Gold.
7. 50's Diner interior — Complete with operating Juke Box of the era, courtesy of Rick Ralston. Guitar Collection, Courtesy of W. Bangkok. Pictorial history and memorabilia portraying the "Godfathers" of Rock n Roll in Hawaii — Ron Jacobs and Tom Moffat. Bright colored Bakelites & Plastics.
8. Set featuring KSSK's Perry, Price & Coble. Wurlitzer Juke Box (courtesy of Rick Ralston). Selected radios.
9. Set featuring KQMQ's Michael Qseng and Kari Steele. Wild novelty radios, plastics, and Robots.
10. Past radio legends J. Aku Head Pupule and Lucky Luck. Pictorial Essays and Leonard Chung's portable collection from all eras.

The enclosed pictures cannot do the display justice. The display covered over 1200 sq. ft.

The Hawaii Chapter also created its own T-Shirt. We would be pleased to send you [Lloyd McIntyre] one as soon as you send us a note informing us of your T-Shirt size.

Aloha, Leonard F. Chung

(Continued from page 25)

This is so because some theaters were designed especially for high-quality sound, and all theater sound equipment is carefully adjusted to give the best possible sound in that building. All adjustments are then left alone. It is not practical to do this with sound equipment in one's home. I think I have come very close to that in my own stereo installation, but it has been costly, and never-ending work for me. I don't know how my equipment sounds to others, but to me it sounds exactly correct, and the tone adjustments are left at neutral positions at all times, except when showing its ability to visitors.

Radio sets continued to be about the same as the years before. Designers were making it easier to tune the short-wave bands, some used dials that required many turns of the knob, and made broadcast-band tuning maddening slow. Others used a second, smaller pointer with an arbitrary numeral scale that permitted logging of short-wave stations. I felt the best arrangement was one that changed dial-scales to show only the band in use, and had a two-speed dial-drive that tuned very slowly for one turn of the knob, then moved the dial much faster the remainder. With that dial, you could rapidly turn to the part of the band you desired, then use one turn of the knob to get right on your station. Some of those sets had the second pointer too, for logging purposes.

AUTOMOBILE-RADIOS

Auto-radios had become so popular that many car owners had a radio, but no heater. Radios and heaters were almost the only significant options on cars of those years. Others were such things as windshield wiper for the passenger side, and an extra tail-light for the right rear side of the car. Everyone who could afford a radio in their new car had one. A very few cars had all-steel bodies, creating a problem locating antennas, the only practical answer was an antenna under the running-boards cars had then. This answer provided lots of work for servicemen. Cars still had to run over many un-paved roads, where the always present stones would tear the antenna off. Later, WARD brought out an antenna that mounted just in front of the windshield, at its center, and curving back over the top of the car. It was supported, by insulators held on by suction cups, about 8 inches above the car top. I have often wondered, why did they not use a vertical rod, as most do now.

Chrysler was supplying a Philco-designed and built radio set in their cars, when desired by the purchaser. That set made very good use of the space on the bulkhead, over the steering-wheel shaft. It was easy to remove, or replace, in five minutes. It was ignition-noise-free, and easily withstood rough treatment from the roads of that time. In my opinion, when ruggedness, sensitivity, tone, power, or selectivity, were compared, Philco won hands-down. Galvin Motorola was a close second. I believe, too, that Chrysler had the best cars, so much so that I purchased a new 1937 De Soto sedan and equipped it for use in

(Continued on page 32)

ARCA Hawaii Chapter Display Featuring 20's-30's Radios, Clothing and Pictorial History

SEE STORY ON PAGE 28

(Continued from page 29)

public-address applications, with a police-service generator, and a much larger 120 ampere-hour heavy-duty battery to supply the very high current my sound equipment required at times.

Metal tubes had almost completely taken over in all new home sets, but strangely enough, they were never very popular in auto-set designs. Another strange fact — , auto-sets were almost always mounted in such a way the tubes were upside-down. I know of no real reason for that practice, there was seldom room to change tubes without removing the set. Sets may have been designed to use metal tubes and had problems with tubes falling out of the sockets. I found this often in auto radios using glass tubes. Another thing I wondered about, even then: auto-sets continued to use flexible cables to a small tuning head on the instrument panel, called a dashboard at that time. How easy it would have been for auto-makers to design their dashboards so the radio could be mounted behind the dashboard, with the controls mounted through the board as they are today. I don't believe it had never crossed their minds. Arvin had produced a very good set mounted that way, with its controls under the bottom and about flush with the dashboard's surface. Beautiful appearance, very good performance, and no flexible cables in the way and breaking after a month or so.

NEXT: A RADIO IN EVERY CAR.

BOOK REVIEW

Empire of the Air: The Men Who Made Radio

Tom Lewis. Harper Collins. 1991. 421 pages. $25.

Reviewed by David W. Kraeuter

I can't imagine anyone interested in radio history not being interested in this book.

Here is the non-technical history of radio from its beginnings through the 1950s, told largely through the concurrent biographies of three radio giants—Armstrong, de Forest and Sarnoff.

Armstrong and de Forest may have been mere rivals at the beginning of their relationship, but by the 1930s that rivalry had turned to hatred. It is extraordinary the means which each man took to have himself proclaimed the winner in the priority debate over who invented regeneration. The obstinate will to succeed which led the two men to make the great discoveries that they did was now used to pursue their legal battles with each other. Though legally de Forest was pronounced the winner by the U. S. Supreme Court on two different occasions, the scientific and engineering communities and many others continued to support Armstrong's claim.

In the late 40s and early 50s Armstrong was to relive this nightmare during his protracted legal battle with RCA and David Sarnoff when he sought redress for RCA's use of his wide-band FM inventions.

If there is a hero in this great bittersweet tale of radio invention and exploitation it must be Armstrong who, despite great public and professional adversity, continued throughout his adult life inventing and revolutionizing radio —regeneration in 1914, the superheterodyne in 1920, superregeneration in 1922, wide-band FM in the 30s, FM radar, and FM multiplexing, which lead directly to stereophonic transmission, among other things. Part of Armstrong's extraordinary technical success followed from his stubborn refusal to believe what "everyone" knew to be true, even when "everyone" apparently had mathematics on their side.

But Armstrong was a tragic hero, done in by his pride, which was manifested in his seeming inability to compromise, when by doing so he could have walked away a successful and wealthy man. But it was not in his nature to do so, and in the middle of his court battle with RCA he committed suicide in 1954.

When Sarnoff, then president of RCA, heard the news of Armstrong's death, he said "I did not kill Armstrong." The statement is so obviously true that one immediately wonders why Sarnoff felt impelled to make it.

De Forest's reaction to Armstrong's death was somewhat different. In a letter to a friend he wrote:

His death was indeed most lamentable. I have always given him full credit for his introduction of FM, but have always taken the keenest delight in having beaten him so thoroughly on the feedback question . . . Well, after all, Armstrong has gone and I am alive, well and happy, and hope to live for many years more. What a contrast!

Do not dismiss the "Sources and Notes" section of this book as important only to librarians and researchers. There is relevant information here that does not appear in the main text, including the bizarre theory of Senator Joseph McCarthy that Armstrong had been murdered when he refused to divulge information about his FM radar research to the Communists.

This popular study—well written, extensively researched, and highly readable—will change the way you think about its three protagonists and radio history in general.

The book has been made into a documentary film of the same title by the author and Ken Burns (of *the Civil War* fame). It will be broadcast on PBS early in 1992.

Dear Mel,

The publication staff and editors agree with you wholeheartedly. So that others might also offer encouragement, we have listed his address here. We now have so many excellent contributors to the Gazette we would like to encourage all of them, and any new writers to help with material.

Lloyd

Larry Babcock, 8095 Centre Lane, E. Amherst, NY 14051

Pictorial history and memorabilia portraying the "Godfathers" of Rock 'n Roll in Hawaii.

20's-30's Living Room depicting Cathederal and Tombstone radios, song sheets, era clothing and pictorial history.

Early model and novelty radios.

Set featuring KSSK's Perry, Price and Coble.
Wurlitzer Juke Box and selected radios.

RADIO '92

To all who contributed to the success of our 1992 Program of Events, I am sure all collectors say THANKS!

Complete addresses and contacts are located on page 37.

We trust there are no errors, as we realize the importance of correct information. However, please contact each event coordinator to confirm dates, times and locations.

Radio '92 Calendar of Events

Organization	Location	Date
*Antique Radio Club of America	Pittsburgh, PA	June 4-6
*Antique Wireless Association	Rochester, NY	September 23-27
*Antique Radio Club of Illinois	Elgin, IL	August 6-8
3rd Annual Radio & Phonograph Show	Campbell Hall, NY	August
Florida Antique Wireless Group	Orlando, FL	March 7
Florida Antique Wireless Group	Orlando, FL	June 20
Florida Antique Wireless Group	Orlando, FL	October 24
Indiana Historical Radio Society	Indianapolis, IN	February 22
*Indiana Historical Radio Society/AWA	Kokomo, IN	April 30, May 1-2
Indiana Historical Radio Society	Elkhart, IN	June 27
Indiana Historical Radio Society	Greenfiled, IN	October 10
*Michigan Antique Radio Club	Lansing, MI	July 10-12
*Mid-Atlantic Antique Radio Club	The Lyon Farm, MD	October OPEN
Museum of Radio & Technology	Huntington, WV	April 18
Museum of Radio & Technology	Huntington, WV	July 4
Museum of Radio & Technology	Huntington, WV	October 24
New England Antique Radio Club	Nashua, NH	January 18
New England Antique Radio Club	Nashua, NH	April 18
New England Antique Radio Club	Nashua, NH	July 18
New England Antique Radio Club	Nashua, NH	October 17
*Northland Antique Radio Club	Minneapolis, MN	May 29-30
Northwest Vintage Radio Society	Portland, OR	May 9
Northwest Vintage Radio Society	Portland, OR	August 8
Western Wisconsin Antique Radio Club	Onalaska, WI	June 27-28

*Conventions of major importance with a large attendance and support from many states and foreign countries.

Addresses and Contacts

Antique Radio Club of America
Jim & Barbara Rankin
3445 Adaline Drive
Stow, Ohio 44224

Antique Wireless Association
P. O. Box "E"
Breesport, NY 14816

Antique Radio Club of Illinois
Carl Knipfel
Rt. 3, Veterans Road
Morton, IL 61550

3rd Annual Radio and
Phonograph Show
Linda Gramm
Box 1, Rt. 207
Campbell Hall, NY 10916

Florida Antique Wireless Group
Paul Currie
(Ph. 407-365-9305 or 895-0146)
P. O. Box 547432
Orlando, FL 32854-7432

Indiana Historical Radio Society
Marilyn Johnston
Rt. 1, Box 218-A
Windfall, IN 46076

Michigan Antique Radio Club
Larry Anderson
3453 Balsam NE
Grand Rapids, MI 49505

Mid-Atlantic Antique Radio Club
Joe Koester
(Ph. 301-725-4229)
249 Spring Gap South
Laurel, MD 20724

Museum of Radio of Technology
Geoff Bourne
(Ph. 304-722-4690)
405 8th Avenue
St. Albans, WV 25177

New England Antique Radio Club
Marty Bunis
RR1, Box 36
Bradford, NH 03221

Northland Antique Radio Club
Box 18362
Minneapolis, MN 55418

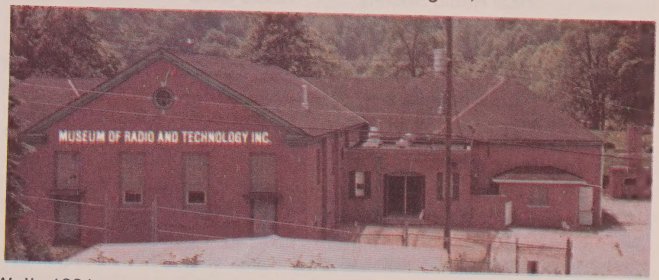
Northwest Vintage Radio Society
P. O. Box 82379
Portland, OR 97282-0379

Western Wisconsin Antique
Radio Club
Dave Wiggert
1025 Oak Avenue So., #B-21
Onalaska, WI 54650

A. C. GILBERT Wireless Set No. 4004, ca 1917 — 2 complete outfits so that each could have a sending and receiving set in his home — Jim Rankin

---

Museum of Radio and Technology
1640 Florence Avenue, Huntington, WV



Well, 1991, warts and all, is just about over. There were some good things to remember, and some best forgotten. I will try to dweli on the better ones.

On April 5th, we received the deed to the Museum of Radio and Technology. We had a meet on July 6th, and again on October 5th. Both were well attended and another will be over by the time this issue is published. We plan to meet on Pearl Harbor Day, December 7th, hoping it will be as successful as the two previous meets. Planned meets for 1992 are

April 18, July 4, and October 24 with another to possibly be announced later.

Visitors have been very well impressed by the re-creation of a late 1920's to early 1930's radio repair and sales shop. This shop has about 700 sq. ft. floor space with a 12 ft. ceiling and is equipped with period items such as brass fan, mechanical cash register, wall phone, 1930's QSL cards, AK 10C breadboard on the workbench and much more. There is a large amount of Eveready advertising. Everything looks right at home in this old building.

We didn't have a lot of time to prepare the building and exhibits this year, but 1992 should see a lot of interesting displays throughout the museum.

We have received some equipment donations this year, among them an early thirties Grunow and some early computers and manuals. A weighted 1800's clock was donated for the radio repair shop.

On a personal note, I am proud to announce that I am now an amateur radio operator, N8OLD. My interest in ham radio was "sparked" prior to World War Two. The pursuit of my ticket was an on and off chase that lasted for more than half a century. Through the years I have built oscillators, bought and misplaced training courses, and finally wound up practicing code on a novelty transistor radio with a key, a fake sounder and a built in oscillator. The radio, a WACO, was made in Japan.

Merry Christmas to all, and to all a good year.

ZANE W. PARSONS, Reporter

*JUST A REMINDER

Membership Dues Are Due

The good news is there is no increase! Your Gazette is now in "Living Color" and twice the size. All for the same small $12.00 per year fee.

However, it costs us twice as much to mail — about 50¢ per issue. How about a voluntary $2.00 donation to just to pay the extra postage. NOT A DUES INCREASE. This will assure you we will not have to decrease the size to reduce the weight.

Make Check Payable To: **ARCA** (mail to Jim & Barbara Rankin)

"My New Year's Resolution Is To Get This Done By January 15th, So The Publication Staff Can Determine Size and Quantity Needed For My Spring Issue."

*Notice for member's dues that expire December 31st.

REFLEX RADIOS

By Ted Babcock

The concept of a reflex radio is believed to have been invented about the time of World War I by a Frenchman, Marius Lateur. These interesting sets fill a place in early radio history between the simple one tube regenerative sets and the much more complex multi-tube tuned RF sets. Reflex sets were generally sold during the period from 1922 to 1925. Variations of the reflex design were introduced on into the late 1930s. This article will attempt to describe what a reflex circuit is and how it works, describe various circuit types, and identify some specific manufacturers of such sets.

The reason for the popularity of reflex circuits with the public was generally based on economics, a few (expensive) tubes in a reflex circuit could perform as well as another set with many more tubes. With the manufacturers, interest in the reflex design was sometimes based on patent considerations. Reflex circuits saved tubes, and tubes were expensive in those days. The reflex sets offered adequate to extremely good performance at reduced cost. For example, sets with only one to three tubes could achieve performance equivalent to other sets using two to six tubes.

A reflex circuit is one where one or more tubes are used for both RF and audio amplification, by proper choice of feedback design and careful choice of components. In a "straight" reflex set the incoming RF signal is passed through one or more stages of RF amplification, and then detected, typically with a crystal detector. The audio signal is then fed back to the first amplifier and passed sequentially thru the same amplifier tubes again, this time amplified as an audio signal. The basic signal flow is shown in Figure 1. While this sounds too good to be true, it worked well if it was designed well. The basic concept was used by a number of early manufacturers, such as Acme, Crosley, DeForest, ERLA, and others.

The representative circuit is shown in Figure 2. The single tube is first used as an RF amplifier. The signal is then detected by the crystal detector, fed to the audio frequency transformer (A.F.T.), and then fed back to the grid of the tube as an audio signal. After amplification, this time at audio, it is fed through the radio frequency transformer (R.F.T.) to the headphones. The condensers across the headphones and the audio frequency transformer primary and secondary pass the RF signal around the windings. The RF coils act as straight through wiring at audio frequencies.

Figure 3 and 4 show more complex circuits. The basic concept is the same. The reader can try to trace out the signal flow. Figure 5 and 6 are of specific sets of the times.

A vacuum tube could have been used for detection, but that would have defeated the purpose of saving tubes. A potentiometer was often used to adjust the bias on the

first audio stage to reduce "noise".

In early literature it states that "the crystal detector is superior to a vacuum tube detector because it gives clearer signals and reduces the interal noises, characteristic of some vacuum tube sets, to practically a minimum."

There were disadvantages to reflex sets. Design was more difficult. Circuit values tended to be more critical than for standard circuit sets, oscillation was more common, the output stage was easily overloaded, causing distortion, and the sets were typically more susceptible to interference, such as from power lines.

In order to alleviate the output stage overloading problem, David Grimes invented the "Inverse Duplex Reflex Circuit". The concept is shown in Figure 7. After detection the audio signal was fed to the last amplifier stage, and from there fed back to the next preceding amplifier, and amplified at audio stage by stage. The intent of the design was to eliminate the final tube from having to handle both the highest level RF signal and the highest level audio signal. His design also included a non inductive rheostat to keep strong stations from overloading the first RF stage. A schematic of the Grimes set is shown in Figure 8.

Both the standard and inverse duplex reflex sets were attractive to the listener who sought distant "dx", but who could not afford a more conventional powerful set with its added tubes. More information on reflex sets can be found in the book, "Radio Theory Simplified", 1925.

Other unusual types of reflex circuits were invented and used by other manufacturers. Sets employing both regenerative detectors and reflex design were used by some manufacturers. One example was the "Regenoflex" circuit used by RCA Victor in the Radiola X, Type 1 set. The Radiola X, Types 2 and 3, were not reflex circuits. For more information on the Regenoflex, see RCA Victor Service Data, Volume 1, pages 11 A and 12 A.

Some radio manufacturers of the early 1920s, and their reflex sets, are listed in the following table:

Manufacturer	Model Numbers	Number of tubes	Date
ACME	Several	1 to 5	1923-25
Crosley	Trirdyns	3	1924-25
DeForest	D10, D12	3 to 4	1923
ERLA	Superflex and others	1 to 3	1924-25
Grimes	4DL and others	4	1924-25
Harkness		1	1925
Premier	7A	5	1924
RCA Victor	Radiola X, type 1 Regenoflex	4	1925

Circuits of these reflex sets are described in "Practical Radio Construction and Repairing", 1927. The list above is only intended to be representative and certainly does not include all of the reflex sets built. In fact there were many reflex radios designed and manufacturerd, on into the 40s and 50s, including superhets. "Popular Radio", January 1925, includes a construction article on an 8 tube, regenerative, reflex superheterodyne. Pictures of most of the sets listed above can be found in "Vintage Radio", by Morgan McMahon. Other reflex sets schematics can be found in Volume 1 of Rider's Perpetual Trouble-shooter's Manual.

Anyone interested in building his own reflex set can find a good set of instructions in the magazine, *"Science and Invention"*, August, 1926. Several types of reflex circuits are described in the article, including one based on the Wheatstone Bridge concept. Many of the radio magazines of the period included construction articles on reflex sets. *"Popular Radio"* presented many reflex designs for the home constructor, during the early 1920s.

A much later design based on the reflex principle is described in *"Principles of Radio"*, by Keith Henny, 1938. This circuit uses a pentode IF amplifier and a diode detector with the audio fed back to the pentode, which then serves as the first audio amplifier. An interesting aspect of this design is that no audio transformers are used. RC filters are used to separate the RF and audio frequencies. By the 1930s, sets with tube saving designs like this were not usually advertised as reflex sets. The design was used to save manufacturing costs. When we talk of reflex sets we generally mean sets that were advertised to the public as reflex sets, and that was generally only in the 1920s.

A reflex set was designed and manufactured by my father, Lawrence S. Babcock, about the time my twin brother, Larry, and I were emerging into this world (1925). Most of the details of his design were lost, but we believe it was a three tube set, with a patent applied for. We believe that a number of these sets were sold around the Jamestown, New York area from 1925 to 1927. Before she died, our mother told us that she had wound all of the coils for the sets in their home shop. However, by then she could not remember any other details of the sets. As a youngster, I remember seeing such a set in his radio service shop, long after it had been placed on a back shelf. Since we are still trying to locate one of these sets, any information we might receive from readers of this article will be greatly appreciated.

Reflex circuits were an interesting "fad" in the USA, which peaked in the 1923 to 1925 period. Their use in foreign sets is not known to the author. Since the inventor of the concept was a Frenchman, it is likely that they were used to some extent in that country. The relatively high performance obtained with a relatively few of the then expensive tubes, made the sets attractive to the public. Their cost reduction outweighed the disadvantages associated with

design of the sets. The relatively limited number of commercial reflex sets that were advertised and sold as reflex sets should make these sets of more interest to collectors than they appear to be. Information from readers on other interesting reflex sets would be of interest to the author, especially information on the Lawrence S. Babcock reflex set.

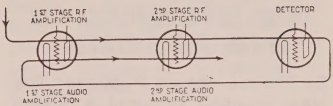

1 ST STAGE R F AMPLIFICATION
2ND STAGE R F AMPLIFICATION
DETECTOR
1 ST STAGE AUDIO AMPLIFICATION
2ND STAGE AUDIO AMPLIFICATION

Figure 1
Signal Flow
Basic Straight Reflex

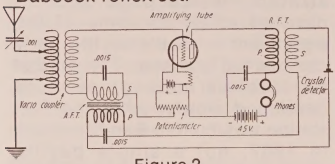


Figure 2
One Tube Reflex Circuit

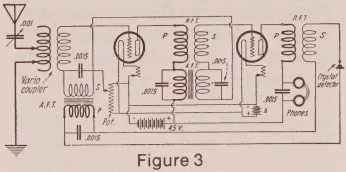


Figure 3
Two Tube Reflex Circuit

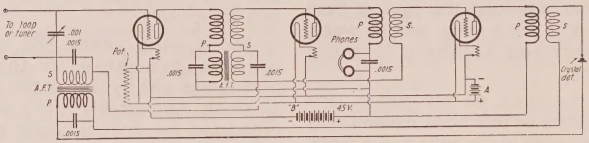


Figure 4 **Three Tube Reflex Circuit**

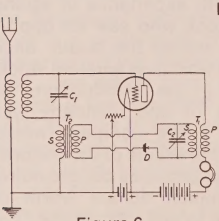


Figure 6
Harkness Reflex Circuit

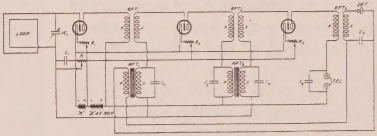


Figure 5
The Squire Reflex Circuit

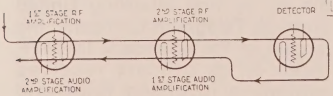

1 ST STAGE R F AMPLIFICATION
2ND STAGE R F AMPLIFICATION
DETECTOR
2ND STAGE AUDIO AMPLIFICATION
1 ST STAGE AUDIO AMPLIFICATION

Figure 7
Signal Flow
Inverse Duplex Reflex

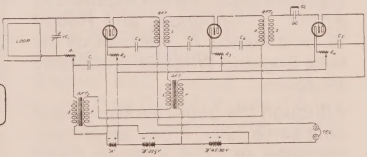


Figure 8
The Grimes Reflex Circuit

BOOK REVIEW

"WIRELESS COMMUNICATION IN THE UNITED STATES"

By Thorn L. Mayes. Publisher: The New England Wireless & Steam Museum - 1987. 242 pages, 6 x 9 inches, soft cover. $29.95

This valuable book deals with "The Early Development of American Radio Operating Companies", and that is in fact the book's sub-title. The author, Thorn Mayes, became a "silent key" on July 27, 1987. His first amateur radio call sign was 6AX, and his last W6AX. During his lifetime he had been an active member of many of radio's learned societies, and had been made an Honorary Member of ARCA. His career spanned the period from spark to solid state, and he was a recognized authority in these fields.

At the time of his death, the chapters of this book existed only as a series of his collected papers, some of which Thorn had presented as lectures over a period of about twenty-five years — some at Conferences of the Antique Wireless Association. Others had appeared in various radio-oriented publications, including periodicals of AWA and ARCA. For the collection of all this varied material for publication in a single, highly readable book, we are indebted to Arthur C. Goodnow, and Robert W. and Nancy A. Merriam of the New England Wireless and Steam Museum.

Although the book has been available since 1989, it has never been reviewed in *"The Antique Radio Gazette"*. Perhaps there are other ARCA members who, like this reviewer, simply had not realized what they were missing. For surely this book belongs in the library of every serious collector of the history and artifacts of early wireless in our own country — those exciting days **before** the dawn, in 1920, of the radio broadcast era.

The book includes a nicely illustrated, twelve page section devoted solely to some of the equipment available to the early commercial stations. The market for wireless message services developed slowly. After the first station was built in San Francisco in 1907, not a single paying message was handled for over a year, no ships on the west coast at that time being outfitted with wireless equipment.

In those early years, the only income available to these companies was by way of the sale of stock. Regrettably many were organized by unscrupulous promoters with experience in selling mining stock who saw an opportunity to exploit the public once more with worthless wireless stock. As noted in the Introduction, "as the stock of one company was sold out, a new company would take over the assets of the old one, leaving the liabilities but providing several million dollars worth of new stock to sell". When the U.S. Government finally took steps to put an end to these shenanigans, it did so by first attacking United Wireless Telegraph Company, the largest of the offenders. In 1911, three of its officers received sentences involving fines and imprisonment. Action was also taken against Continental Wireless

Telephone and Telegraph Company, and the DeForest Radio Telephone Group.

The book's major section, on the operating companies, is divided into eleven chapters each dealing with one of the ten groups of operating companies, among them such organizations as DeForest Wireless Telegraph Co. (a group of fifteen companies all told), Marconi Wireless Telegraph Company of America, and Federal Telegraph Company. This section of the book, too, is profusely illustrated with photographs, charts, diagrams and maps.

Because of its importance to wireless communications during the latter part of this pre-broadcast period there is a separate, twenty-four page chapter devoted to the Alexanderson Alternator. This chapter is illustrated with schematic and mechanical diagrams, and photographs of several of the alternators, one rated at 200 KW.

For Broadcast-centered readers there is a seven-page chapter on "America's First Broadcast Station". The reader must judge for himself if the described activities of Dr. Charles D. Herrold's station detracts from KDKA's seemingly solid claim to "first American broadcast station." But it is interesting that this west coast station (whose first call was "San Jose Calling" in 1907, followed later by "FN" and, in 1916, by "6FX"), effected modulation of its carrier, first, by way of a Swedish "dust transmitter" microphone in the primary circuit of the spark coil. By mid-1909, the station employed an arc system to generate its carrier. A battery of six carbon button transducers connected in parallel, mounted on a single water-cooled diaphragm, placed in the antenna ground circuit effected audio modulation of the carrier.

A surprise to this reviewer was the chapter on "Harry Shoemaker, an Overlooked Wireless Pioneer". Shoemaker is not listed in that bible of early pioneers, Dunlap's "Radio's 100 Men of Science". Shoemaker built his wireless transmitter and receiver in the period 1894-1896, sending and receiving signals over a distance of 150 feet. Mayes states that the apparatus employed "was almost identical to that described by Marconi in his patent application of 1896", but "the notion of seeking a patent had not occurred to Shoemaker".

This book is available from the publisher at 697 Tillinghast Road, East Greenwich, RI 02818.

Reviewed by Bill Denk, W3IGU

In late 1922 The Department of Commerce established a new wavelength for a select few super stations, 400 meters, so they could operate without interference from other stations, all operating on 360 meters. These super stations had to meet strict requirements on power (more than 500 watts), programming from a studio, and special modulation.

Station KSD, owned by the St. Louis Post Dispatch, was the first station authorized by the Department of Commerce to broadcast on the new wavelength of 400 meters, established in 1922.

Another great member service . . .

SOUND REMEDY

LOUDSPEAKER RECONING PRICE LIST

(Stereo, Musical Instrument, Jukebox, Automobile, Radio and TV)

March 1, 1991

CAST FRAME SPEAKERS	
Size	**Price**
4" Diameter	$21.00
6" Diameter	$27.00
8" Diameter	$33.00
10" Diameter	$40.00
12" Diameter	$45.00
15" Diameter	$60.00
18" Diameter	$75.00
3"x5" Oval	$21.00
3"x6" Oval	$21.00
4"x6" Oval	$21.00
2"x10" Oval	$27.00
3"x10" Oval	$27.00
4"x8" Oval	$27.00
4"x10" Oval	$27.00
5"x7" Oval	$27.00
5"x8" Oval	$27.00
5"x10" Oval	$27.00
6"x8" Oval	$27.00
6"x9" Oval	$27.00
3"x14" Oval	$32.00
6"x10" Oval	$32.00
6"x11" Oval	$32.00
7"x9" Oval	$32.00
7"x10" Oval	$32.00
7"x11" Oval	$32.00
8"x12" Oval	$40.00
8"x14" Oval	$40.00
9"x13" Oval	$40.00
9"x15" Oval	$45.00
9"x21" Oval	$60.00

STAMPED FRAME SPEAKERS	
Size	**Price**
4" Diameter	$20.00
6" Diameter	$25.00
8" Diameter	$30.00
10" Diameter	$35.00
12" Diameter	$40.00
15" Diameter	$50.00
18" Diameter	$60.00
3"x5" Oval	$20.00
3"x6" Oval	$20.00
4"x6" Oval	$20.00
2"x10" Oval	$25.00
3"x10" Oval	$25.00
4"x8" Oval	$25.00
4"x10" Oval	$25.00
5"x7" Oval	$25.00
5"x8" Oval	$25.00
5"x10" Oval	$25.00
6"x8" Oval	$25.00
6"x9" Oval	$25.00
3"x14" Oval	$30.00
6"x10" Oval	$30.00
6"x11" Oval	$30.00
7"x9" Oval	$30.00
7"x10" Oval	$30.00
7"x11" Oval	$30.00
8"x12" Oval	$35.00
8"x14" Oval	$35.00
9"x13" Oval	$35.00
9"x15" Oval	$40.00
9"x21" Oval	$45.00

Telephone: (609) 869-0238

Ship To Address:

Sound Remedy, 331 Virginia Avenue, Collingswood, NJ 08108

Our terms are cash on delivery or payment in advance (to avoid the C.O.D. charges). New Jersey residents must add 7% sales tax. Please make your check or money order payable to **Sound Remedy.** *When paid in advance we return ship freight prepaid and bill via United Parcel Service, F.O.B. Collingswood, New Jersey.*

Above prices and terms subject to change without notice.

BOOK REVIEW

by William Denk
Devon, PA

THE AWA REVIEW

VOL. 6, 1991

Publisher: The Antique Wireless Association, Holcomb, NY. Editor: Ludwell Sibley. 182 pages, 6x9 inches.

Carrying on the fine tradition of preceding AWA Reviews, this volume presents ten information-packed articles on topics of interest to collectors and historians. An exciting surprise to this Reviewer were revelations in the article by Robert Champeix, "Who Invented The Superheterodyne?", first published in France in 1979, and translated from the French by Richard Foster. Champeix convincingly adds a **third** name, that of Paul Laut, to the more familiar names Lucien Levy and Edwin Armstrong, the usually-recognized contenders for the title of inventor of the superheterodyne. Read this article and decide for yourself who was first!

The twelve-page lead article, "The Eaton Tube Collection", by five contributors (Clark, Kelley, Peckham, Horle, and Eaton) offers photographs and descriptions of what may be the first serious collection of U. S. and European tubes, and its untimely end. The period covered extended from the beginning of the art through 1919.

An article by John M. Anderson, "The General Electric Company Considers Buying The DeForest Radio Telephone and Telegraph Co., 1916" provides insight into the fortunes of Lee DeForest in early 1916 when he entertained thoughts of selling out to G. E. Anderson describes the visit to the DeForest plant by a G. E. representative, and the latter's "trip report" to his superior.

"The First Years Of Wireless In The Hawaiian Islands" by Islanders Tina and Robert Wiepert deals with the evolution of commercial wireless in the Islands during the period 1900-1930. Early efforts by Marconi Company engineers to link the Islands failed, but ultimately the Islands were successfully linked, and by 1908 communication with the mainland was established. The 23 illustrations add considerable interest to the documentation.

Pat Leggatt's article, "A Review Of Early Television In The UK", documents developments in England from primitive disc scanning to early color. The potential for an electronic approach was outlined by Rosing and Campbell-Swinton in 1911, but the technology did not then exist for their well conceived ideas to be put into practice. Thus the focus was first on mechanical systems (30 lines, 12½ pictures per second). Leggatt states that standard was used in the BBC's experimental transmissions from 1929 to 1935. Baird finally went to 240 lines, 25 pictures per second. This prevailed until the British Television Service adopted a 405-line all-electronic system in February 1937. The paper concludes with a commentary on color television and the development of the NTSC (U.S.), SECAM (France), and PAL (most of the rest of Europe) systems.

The reader will find a comprehensive listing of U. S. Army Signal Corps equipment from before WW I to the early part of WW II in a 47-page article by Frederick W. Chesson. The list comprises SCR-coded systems (385), RC-identified subsystems (289), and individual BC items (basic components - 1093). This Reviewer could not resist checking his few Signal Corps pieces against that listing. Sure enough, there was his wavemeter, plainly marked SCR-95, dated 8-27-16. But G. E. had omitted to place an SCR identification on his "Receiving Set Type D, Signal Corps U. S. Army, Order 9968, 1917".

"Amateur Radio In The New York City Area Pre-WW I", by Daniel C. McCoy, W8DG, is a most welcome reprint from the AWA OTB, Vol. 2, No. 3, 1961. In his "Foreword", the Editor correctly refers to it as "a charming account of early amateur radio in the New York area".

Fin Stewart, a long-time collector in Tamworth, NSW, Australia, offers us a ten-page account of "Radio Tube Manufacture In Australia". He covers the activities there of Amalgamated Wireless (Australasia) Limited, Philips Lamps Limited, and Standard Telephones and Cables Pty Limited. Included are 18 illustrations of some of the tubes produced.

Another instructive look into the past is provided in a 20-page article by Louise Moreau, W3WRE, "The Military Communications Explosion, 1914-18". It is not easy for us now, as we sit before our solid state, 100 watt, digital read-out SSB transceivers, to appreciate the status of the communications arts in 1914, as Europe, and later the U.S., prepared for war. Moreau reports, for example, that Italy was using a pair of linen strips to signal in an alphabetical code, not unlike the 92-position semaphore system used in Napoleonic times. The U.S. Signal Corps initially felt that the wig-wag system was still effective, while the French swore by the carrier pigeons that had proven so effective in the Franco-Prussian War. Our General Pershing liked the French pigeon idea so much that he ordered the Signal Corps to include classes in the training and handling of these birds! Under these circumstances, it is not surprising that messages from scouting and observation planes were at first written and then dropped from the plane to a messenger stationed at a signal post. Radio historians must not miss this well-illustrated (25 all told) article which takes the reader well beyond the era of the carrier pigeon.

Finally, David W. Kraeuter, in a 30-page article, "The U.S. Patents of Alexanderson, Carson, Colpitts, Davis, Gernsback, Hogan, Loomis, Pupin, Rider, Stone, and Stubblefield", lists 644 patents of these inventors. The reader should note that Kraeuter had previously published, in the Vol. 5, 1990 issue of the AWA Review, the U.S. patents of Armstrong, Conrad, DeForest, DuMont, Farnsworth, Fessenden, Fleming, Kent, Marconi, and Zworykin. If only this Reviewer, a long-time collector of significant patents in the radio arts, had had access to these lists fifty years ago. It was then that he began to wonder about the early history of radio, and to realize

what a truly great resource these patents are.

Paperback $10.00 plus $2.50 S&H. Order from AWA Editor, 44 E. Main Street, Flemington, NJ 08822-1224. Also available from Antique Electronic Supply, 6221 S. Maple Avenue, Tempe, AZ 85283.

Gentlemen;

Please include this advertisement in your next ARCA-Gazette. This is a fund raiser for our new ARCA Chapter. ARCA-Hawaii has been holding workshops, open to the general public, on Antique Radio Collecting-History-Restoration, that have been very effective in promoting Old Radio collecting. The fund raiser is to buy parts for building crystal radio sets, which we will provide free to children who cannot afford the modest costs of the parts. The classes to build the sets are part of our workshop series. ARCA-Hawaii is also providing SW sets to handicapped invalid persons and the blind. This is part of our "Window on the World" program.

FOR SALE: ARCA-Hawaii Chapter T-Shirts. ARCA LOGO on the back, Hawaii Chapter Logo on Front Pocket. Heavy Duty white T-Shirt. Black Print. Sizes S, M, L, XL. $11.50 PPD Surface. $13.00 PPD Air.

ARCA-Hawaii, 95-2044 Waikalani Pl. C-401, Mililani, HI 96789, (808) 847-3313.

Aloha, Leonard Chung, President ARCA-Hawaii.

Hi Mel,

I was very much surprised when I received my Fall 1991 issue of the Antique Radio Gazette.

I am referring to the nice advertisement on page 53, titled, HARD TO FIND RADIO PART? Please extend my thanks to the person or persons that were responsible.

I also wish to congratulate the publication staff of ARCA for a superb publication "THE ANTIQUE RADIO GAZETTE", now being published "IN LIVING COLOR".

Sincerely, James A. DiRuzza, 2607 Old Troy Pike, Dayton, OH 45404, (513) 233-5004 evenings.

Lloyd,

Just a note to commend you and your publication staff on the Fall 1991 Antique Radio Gazette. Not only were the articles excellent (quality **and** quantity), but the color photos were superb. I believe you have created **the** antique radio publication by which all others will be judged. This hobby has long awaited a professional quality publication and the Gazette is it. Keep up the good work.

Thanks, Bill Dawson, Pittsburgh Antique Radio Society, Inc.

Hi there Lloyd!

Last Gazette was a whopper! I especially liked the article by Larry Babcock. I wish we could get him to write more articles along those lines . . . If I had his address . . . I would write him a letter of encouragement to write more articles! Although I have heard his name many times in the past, it is only recently that I have met him.

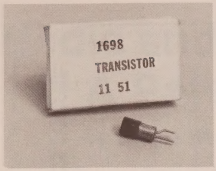
Mel

LIFE MEMBERS

Bruce Kelley W21CE, HONORARY
Bill & Jane Denk, HONORARY
John & Ruth Drake, HONORARY
Brian C. Belanger
Dr. Max deHenseler
Bruce Eddy
Rick Ferranti
Daniel Beimer
Jim Rankin
Deanna & Donald Hames
Lloyd McIntyre
James P. Chew
Anthony J. Molettiere
Peter Pitcher
Peter C. Brickey
Joseph V. Musachia

OUR NEWEST MEMBERS

Roger E. Tomassetti, Wooster, OH
Edward Lipski, Yardley, PA
David Metz, Staunton, VA
Thomas Kellerman, Cleveland, OH
Jim Yearwood, Oakland Park, FL
Stephen C. Brown, Charlotte, NC
Keith & Sheila Womack, Krebs, OK
Sheridan Rand, Uncasville, CT
John W. Chandler, Huntington, WV
Michael J. Bowe, S. Charleston, WV
Keith B. Shepherd, Ewing, KY
James R. Shepler, Laurel, MD
Bob Eslinger KR1U, Pomfret Center, CT
Greg Pitts, State University, AR
David Cooksey, Anderson, MO
John J. Trimble, Peach Bottom, PA
Gene Hughes, Ellerslie, GA
Gary M. Staurt, Bethlehem, PA
Sal Volpini, Sarnia, Ontario, Canada
Joel Levine, Greenlawn, NY
Jim Grims, Wichita, KS
Carol G. Mowery, Middleport, OH
George S. Kaczowka, Boylston, MA
Joe Dimaggio, Hartford, CT
George Schwarz, Cleveland, OH
Richard Hodapp, Kalamazoo, MI
Dan Phelan, Penfield, NY
Robert J. Shuck, Fishers, IN
Ernie Hite, Rock Hill, SC
M. L. Young, Hot Springs, AR
Ned Borger, Northampton, PA
Gary Reif, Fairport, NY
Michael Katz, Seaford, NY
Gerry Meekins, Elkton, MD
Edward Anthony, Providence, RI
Thomas McClenin, Hilton, NY
Martin D. Bergan Jr., Phoenix, AZ
Stephen Susch, Horseheads, NY
Michael Callahan, Winchester, MA
Lawrence Chestnut III, Stillwater, ME
Jody Everett, Buda, TX
Staff Stafford, Delaware, OH
Jack Hart, Mashpee, MA
David J. Minchella KE2GE, Henrietta, NY
Mark Land, Rochester, NY
Eric Fogel, Parsippany, NJ
Ed Janssen, Lewisville, TX
Ray Schmidt, Austin, MN
Carl R. Shirley, Columbia, SC
Harry H. Olmsted, Arlington, VA
Andrew Mowatt, Guelph, Ontario, Canada
Stephen A. Ruggles, Queensbury, NY
John K. Grady, Littleton, MA
Tom McGlashen, San Jose, CA
Michael Wimer, Woodbridge, VA
Dean Smith, St. Louis Park, MN
Christopher Williams, Brentwood, TN
Marcus B. Child, Kailua, HI
Cameron Guthrie, Guelph, Ontario, Canada
Alfred W. Bennett W3CFZ, Windsor Locks, CT
Jim Tate, Malvern, PA
Harold M. Rosenfield MD, Palos Verdes Est., CA
Leonard Hunter, Meadville, PA
Roger Evans, Evanston, IL
Harvey Daniel Rieff, New Milford, NJ
Lee Bruton, Lakewood, CO
David Sellers, Akron, OH

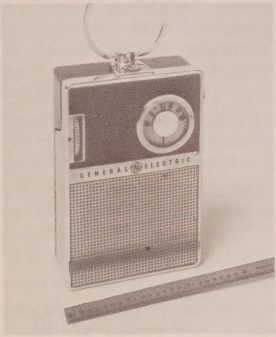


TRANSISTOR TOPICS

General Electric Model P850-B

An American Made Miniature From 1961

By Ross Smith



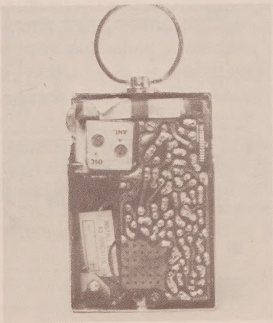
Subject set is a six transistor radio in a very attractive small case with a chrome plated and black painted die cast metal housing and a black plastic cover. It measures 3½"x2⅜"x1" thick and weighs 7½ ounces without the battery. It has a 1½" diameter carrying ring at the top and also has a phone jack on top, where it should be.

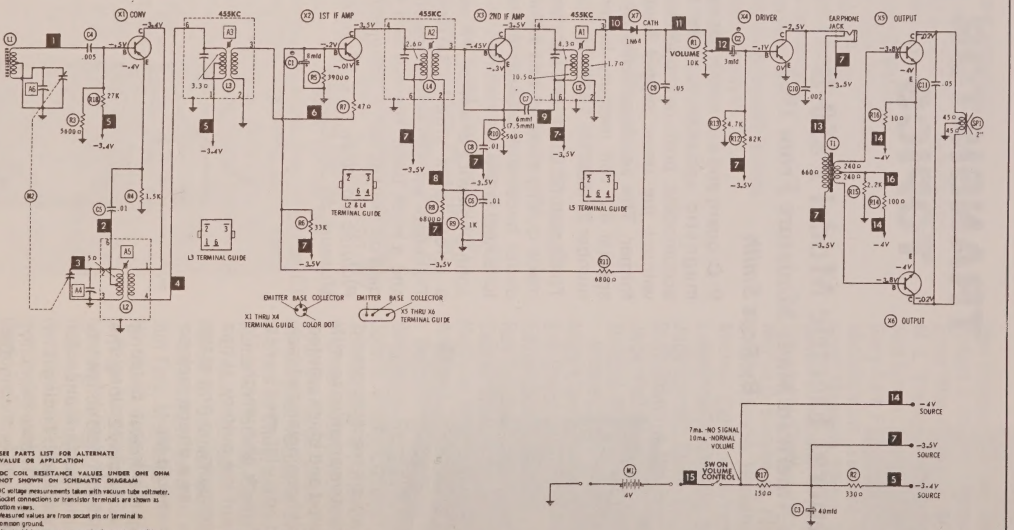
Considering the metal housing and a bar antenna only 2" long, the set plays well with good sensitivity and surprising performance for such a small package. Tuning is by a solid dielectric variable capacitor connected to a vernier tuning dial. Transistors are soldered into the P. C. board and a 2" center-tapped magnetic speaker is used to accomodate push-pull operation without the usual output transformer. The set is powered by a special 4.2 volt mercury battery, number E-133.

This small G. E. set is a very well made quality product and will no doubt become a popular collector's item in the near future.

John Okolowicz of Amber, PA sent a photo of a small Clairtone Transistor set with earphones only and a neck band. We can find no data on this set; can anyone help?

Pictures courtesy of CTS-Turner Museum, by Joe Carlson.





● SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

1. DC voltage measurements taken with vacuum tube voltmeter.
2. Socket connections or transistor terminals are shown as bottom views.
3. Measured values are from socket pin or terminal to common ground.
4. Nominal tolerance on component values makes possible a variation of 15% in voltage and resistance readings.
5. Volume control at maximum, no signal applied for voltage measurements.

A PHOTOFACT STANDARD NOTATION SCHEMATIC with CIRCUITRACE

©Howard W. Sams & Co., Inc. 1962

RESISTANCE MEASUREMENTS NOT GIVEN BECAUSE OF THE WIDE VARIATION IN INTERNAL TRANSISTOR RESISTANCE.

NUMBERS ASSIGNED TO COILS, SWITCHES, PLUGS, SOCKETS, AND TRANSFORMERS ARE TO FACILITATE CIRCUIT TRACING OR COMPONENT REPLACEMENT AND MAY NOT NECESSARILY BE FOUND ON THE UNIT.

GENERAL ELECTRIC MODELS P850B, P850C, P851C, P8501B, P8501C, P8511C

Radio and Television Pioneers
A Patent Bibliography

by David W. Kraeuter, Washington, PA, 1991

FOREWORD

This bibliography can be of use to anyone studying the technical history of radio and television, particularly as it developed in the United States. Over 3,000 U. S. patents are cited and indexed for 40 radio and television pioneers.

Patents are arranged chronologically under each inventor's name. This arrangement provides a sense of the historical development of the inventor's work. Citations take the form *Title. Number. Date.* When the *U. S. Patent Gazette* reference is known, it follows, given as *Volume: Page.* This information was gathered from various indexes compiled by the U. S. Patent Office.

An alaphabetical list of patent titles is provided for each inventor with ten or more patents. A cumulated personal name index locates citations to patents that were granted in the name of more than one person.

Copies of any of these patents may be obtained using the information on page 186. Patents may also be consulted and copied at the Patent Depository Libraries shown.

Only U. S. patents are listed. Some of these inventors also patented their devices in other countries, such as Germany and England.

I have attempted to list all U. S. patents granted to these inventors, whether the patent relates specifically to electronics or not. Some inventors listed here worked largely outside the field of electronics. They were included because of their strong connection with the development of radio — H. P. Davis as a founder of KDKA and H. P. Maxim as a founder of the American Radio Relay League are examples. The patents of Thomas Edison and Nikola Tesla were not included because complete editions of them have been published elsewhere.*

I searched for but found no U. S. patents in the name of Frank Andrea, Alfred Ghirardi, Robert E. Kintner, Charles Kolster, Charles Leutz, or Philip Mallory.

I thank Ludwell Sibley of the Antique Wireless Association for publishing sections of the bibliography in the *AWA Review.* Thanks also to Bev Martin who helped with proofreading and Alan Douglas who supplied some dates. Lastly I thank the staff of the Science and Technology Division of the Carnegie Library of Pittsburgh, where most of this information was gathered.

*See Edison, Thomas, *Patents Granted to Thomas A. Edison, 1869-1918,* Washington, D.C.: Microfilm Publications, National Archives, 1981 and J. T. Ratzlaff, *Dr. Nikola Tesla, Complete Patents,* Millbrae, CA: Tesla Book Co., 1983.

A Patent By Any Other Name . . .

by David Kraeuter

The next time you apply for a patent, think very carefully about what you call your invention. Most inventions are not known by the name or title the inventor gave them. Here are only a few examples from many in radio and television history.

Inventor	He called it	U.S. Patent Number and Date	We call it
Edwin Armstrong	Wireless receiving system	1,113,149; October 6, 1914	Regen circuit
	Receiving high-frequency oscillations	1,342,885; June 8, 1920	Superhet circuit
	Radioreceiving system having high selectivity	1,416,061; May 16, 1922	Superregen circuit
John Carson	Method and means for signaling with high frequency waves	1,449,382; March 27, 1923	Single-side-band carrier-suppressed transmission
Edwin Colpitts	Oscillation generator	1,624,537; April 12, 1927	Colpitts oscillator
Frank Conrad	Wireless receiving set	1,664,192; March 27, 1928	Aeriola Junior
Lee De Forest	Space telegraphy	879,532; February 18, 1908	Audion or triode
	Audion-circuit	1,377,405; May 10, 1921	Grid leak
Allen Du Mont	Cathode ray device	2,098,231; November 9, 1937	"Magic eye" tube
Philo Farnsworth	Image dissector	2,087,683; July 20, 1937	TV camera tube
Reginald Fessenden	Electric signaling apparatus	1,050,441; January 14, 1913	Heterodyne circuit
John Fleming	Instrument for detecting electric oscillations	954,619; April 12, 1910	Vacuum tube diode
Louis Hazeltine	Neutralizing capacity coupling in audions	1,533,858; April 14, 1925	Neutrodyne circuit
John Hogan	Apparatus for wireless signaling	1,014,002; January 9, 1912	Single-dial tuning
Charles Jenkins	Radiovisor		Mechanical television
Frederick Kolster	Decrementer		Wavemeter or frequency counter
Benjamin Miessner	Detector for wireless apparatus	1,104,065; July 21, 1914	Cat's whisker
Greenleaf Pickard	Detector for wireless telegraphy and telephony	1,104,073; July 21, 1914	Crystal detector

Copies of patents may be ordered from the Commissioner of Patents and Trademarks, Washington, D. C. 20231. Copies are $1.50 per patent postpaid, and should be ordered by patent number. Patents may also be consulted and photocopied at Patent Depository Libraries listed on pages 189-190 of AWA REVIEW volume five.

CONTENTS

(Number in parentheses is total number of patents listed for that inventor)

Ernst Alexanderson (344) ... 1
Edwin Armstrong (51) 18
Hollis Baird (5) 21
John L. Baird (27) 22
John R. Carson (23) 24
Edwin H. Colpitts (23) 26
Frank Conrad (178) 28
Harry P. Davis (75) 38
Lee de Forest (216) 43
Amos Dolbear (13) 55
William Dubilier (173) 56
Allen B. Du Mont (35) 65
Philo T. Farnsworth (124) ... 68
Reginald A. Fessenden (229) 75
John A. Fleming (13) 88
Hugo Gernsback (37) 90
Alfred N. Goldsmith (134) ... 93
Louis Hazeltine (26) 100
John V. L. Hogan (31) 102
Harry Houck (20) 104
Charles F. Jenkins (277) 106
A. Atwater Kent (104) 121
Samuel Kintner (59) 128
Frederick Kolster (76) 131
Mahlon Loomis (6) 136
Guglielmo Marconi (39) 137
Hiram P. Maxim (68) 140
Benjamin Miessner (143) ... 144
Joseph Murgas (15) 151
Greenleaf W. Pickard (97) .. 153
Michael I. Pupin (34) 159
John F. Rider (8) 162
David Sarnoff (2) 163
McMurdo Silver (1) 164
John S. Stone (152) 165
Nathan B. Stubblefield (4) .. 172
Sarkes Tarzian (12) 173
Clarence Tuska (21) 174
John Victoreen (36) 176
Vladimir Zworykin (114) 179

How To Get Copies Of Patents 186
Patent Depository Libraries 186
Personal Name Index 189

This book is being published and should be available in the near future. We're excited and want to thank Dave Kraeuter for his many hours of dedication to such an effort.

MEL'S CORNER

An unforgettable Christmas in 1920 — now recalled?? Living then in West Orange, New Jersey, my grandfather (a few days before Christmas) escorted me to that fabulous Radio Market in New York City — known as Cortland Street!!

All the surrounding area around there was well known for its many shops of radio equipment — both new and old.

The craze for a working radio — useful for the average person had just **exploded!** Radio was soon to become a household item!

Before that time, it was the here and there tinkering fellows with their crystal sets picking up a station or so from local areas. Transmitting amateurs with their spark rigs were well on their way with developments leading to tubes and CW means of communications.

Roof tops of houses could be seen with all kinds of wires and insulators — some with BIG lightning switches to be grounded during electrical storms. Four wire flat top antennas with spreaders could be seen going every direction! The longer and the higher ones were promising greater results.

The apartment houses, with multiple tenant families, became a mass of confusion. Wires crossed everywhere over the roofs — some were shorted or torn away — which led to many a "conflab" with the tenants! More radios appearing — more aerials showing up!

But radio had arrived then — full blast. Inexpensive crystal sets were the order of the day. Factory made ones were at hand, but "Make your own radio" was exploited in the newspapers and literature.

This led to — **wind** your own coils — find a chunk of galena — a cat's whisker of fine wire — and get a long wire aerial on the roof or trees.

It was a big deal for the then radio shops — who packaged exotic minerals in small round wood boxes with names such as — "XTRA LOUD sens crystal" — "Death Valley crystal" (a popular one!) "DU-TEC xtal by Dubilier" — "Footes Pyrite" — "Silicon by Bunnell". Cat's whiskers came packaged in small glass tubes, some labeled "Super-Fine." All these — now collector items?

The crystal set required fiddling around with that fine wire cats-whisker to find a sensitive spot on the galena. What a boon — when tube sets arrived for the average person!

Often some high powered commercial spark station nearby would come blasting in — the listener not able to read high speed code! This promoted some manufacturers to produce Wave-Traps for offending signals. Depending on location — some worked on broadcast — but if you were next door to a spark station — OUCH!!!

Here in the 1920's appeared table

sets in cabinets with tubes, easy to tune, ready to go. At the flick of a switch you were on the air — to get the news — from the few local broadcast stations existing then!

At this point it was prime conversation with the neighbors —"How far did you get last night??? Did you hear KDKA Pittsburgh? Philadelphia? — Chicago? Ever get Des Moines, Iowa? Boy!! — that one was a doozy to add to the list!! WOW — These were well known as the DX bugs!! Always trying, buying, experimenting — anything to improve reception!! Ads appearing in Radio News ads featured station call letters of those hard to get localities — this to enhance the qualities of the sets they were selling. East coasters — get California?? Always the big come-on — Dig deeper-in your pockets!! Let's go!

Anyway — so now we are walking down Cortland Street. At the far end near the river, we come to a store so loaded inside that the sidewalk is piled up with large commercial receivers — most junked from various ship's surplus. Take your pick for a few bucks and haul them away!

Wireless Specialty! — Amrad! — National Electric! etc. the IP's! All with those beautiful shiny nickel dials, multiple switch taps, detectors, tube units, cabinets. For a buck or so — take the ones bashed up, or missing parts, or robbed of a few components.

Little interest appears in these long wave receivers and Government surplus ones. Just a few fellows digging out a crystal detector or so, some knobs, binding posts, etc. Just push out the rest to the gutter — Trashmen will take care of these! Imagine!! if a place like this existed TODAY!!!!!

Next we round the corner to Fulton Street. Here at number 45 Fulton we find that World Famous Electro Importing Company with Hugo Gernsback presiding! Shelves after shelves of beautiful equipment, well organized with a number of sophisticated clerks behind the counters explaining the qualities of various items of equipment and how to use them.

Adjacent to this store building was the lab of Mr. McCandless who made up the DeForest spherical audions. When the E. I. Company came out with their early spherical audion control unit it was handy to run next door and pick up some tubes. McCandless was the predessor of the vacuum tubes to come!! It was a dying market at that time as the new Radiotron Uv-200 detector tube had taken over the market with their one ampere tubes. These were very evident in the more modern sets we saw as we later walked up Cortland Street.

However, as we walked around the E. I. Store — tucked into a remote corner on a shelf set several of E. I.'s Spherical audion control units of early days resplendent and forgotten on their wood base with wood mounted rheostat inscribed with E. I. insigna.

The ultimate of my day there was when Grandpop purchased a brand new E. I. loose coupler for me as my Christmas present!! Going back across the Hudson River to the old DL&W rails, I coveted my package along with the latest issue of Radio News — December 1920!!

Going further up Cortland Street there were no end of famous radio stores — Davega and many others, all displaying beautiful cabinet radios in their windows!!

My thoughts then were — Who would want to pay all those fabulous prices for a radio when the real fun and joy was making one YOURSELF!!!!

What fun it was then to build up the early sets from scratch. No wonder, now in these later years, I still enjoy making them up — as so called — "Mel's Radiodynes" — HI!!!

MERRY CHRISTMAS!!!!!

Mel

FREE ADS

Up to twelve Gazette lines of copy are available to our ARCA Members!! We do ask that you write your ad on a separate sheet of paper, type if possible, or print, and be sure to include your name and address. We reserve the right to edit all ads. ARCA is not responsible for any transactions, of course.

Owing to time constraints, we cannot extensively proofread names, addresses, or numbers. If a mistake appears in your listing, please notify the GAZETTE and we will print a correction in the next available issue.

WANTED. Command set BC-946 or Navy R24-ARC/5 broadcast band. Also console radio late 30's early 40's w/SW. Hallicrafter SX-71. George Stringe, 3075 Moorhead Ave., Boulder, CO 80303.

WANTED. Nixie tubes (tubes that display numbers or letters). How may types are there? Does anyone have any technical data? I would like to get as many different types as possible. I will buy tubes or trade a great schematic for a Nixie Tube Clock I designed. Nixie Tube Clock schematic is also available alone for $10.00. Leonard J. Arzoomanian, 61 Columbus Ave., North Providence, R.I. 02911, (401) 232-0869.

WANTED: Crosley audio transformer as used in Model 50-51 series, open circuit windings OK. Need schematic for Ameco VFO, Model VFO 62. Collector of WeCo items — tubes, components, receivers, amps, and literature. Tad Drogaski N3J2Q, 507 Coal Valley Road, Jefferson Boro, PA 15025-3730.

WANTED: Instruction Manual for Precision Apparatus Model 954 Electronomic tube and set tester. Tube Substitution manual. Any information on how to test tubes not listed on my tube tester scroll. Any information on tubes used in 1950's and 60's FISHER Tube Stereo units. ANY Fisher tube equipment MPX300 Multiplex Generator, FMR-1 Broadcast Monitor etc., Al Pugliese, 27 Daleham Street, Staten Island, NY 10308, (212) 850-0687 days, (718) 948-7489 evenings and weekends anytime.

WANTED: Citizens Radio Call Book Magazines for 1920 thru 1925. Bob Arrowsmith, P. O. Box 166, Annandale, Va. 22003 or call collect (703) 560-7161.

OLD RADIOS WANTED: By Collector. John M. England Jr., P. O. Box 1674, Alexandria, VA. 22313, Ph. (703) 841-9498.

WANTED: Reasonable price paid for an original copy of the Antique Radio Gazette Vol. 5, No. 3 (1977) which will complete my set. Thanks! Bill Ross, 875 Gordon Terrace, Winnetka, IL 60093 (1-800-621-0687 days).

WANTED: Audio transformers and bakelite chassis panel for DeForest F-5. Cabinet and speaker for Philco 20 & 90. **FOR SALE:** Several cathedral speakers, $25 each; Several headphones, $15 each. Don Sturzenbecher, Rt. 3, Box 28, Sioux Falls, South Dakota 57106, (605) 368-2135.

FOR SALE: Power supplies, mid 1920's, Majestic "A" pack 0-6 volt, Majestic "B" pack 0-135 volt 3 outputs, working, very heavy. **FOR SALE:** 3 vernier dials, 0-100, 4" round black bakelite and brass tuning dial, Marco aoz 1928 pat number. Kuprex AB model 196 eliminator 0-6v, 0-180 v. circa 1926, working. SASE & $1.00 for photo. George Greenberg, 1701 Andros Isle K-2, Coconut Creek, FL 33066, (305) 971-9053.

SALE: Kolster Model 6-D. It has six 201-A tubes, not tested. Set is in nice condition. Would like $200.00 for it. Also have a metal Silvertone Model 91, Ser. S29582, using seven 01A tubes - condition is good - for $50.00. Several horn speakers now available. Edmund DeCann, 307 3rd Avenue W., Osakis, Minnesota 56360. Tel. (612) 859-4282.

WANTED: I need the following two Riders to complete my set. I want to buy Vol. VI (6) and Vol. XVI (16), also would like old Gernsback manuals. Call 218-564-4623 or write. Walt Wrabek, Rt. 4, Menalga, MN 56464.

WANTED: Dial glass for RCA Victor Model A-33 console. Please write: Hans Alderliesten, 3718 Happy Valley Road, RR#1, Victoria, B.C. Canada V9B 5T7.

WANTED: Browning-Drake Receiver - Copies of any factory info on American Bosch Mdl 16 "Amberola", Bill Noro, 126 Evaline Street, Pittsburgh, PA 15235, (412) 371-2988.

WANTED: Need restorable junker chassis and speaker for Jackson Bell Model #62 Radio. **HELP:** I need miscellaneous parts (hardware, sails, mast, etc.) to complete the restoration of a Majestic Melody Cruiser Model #921 Radio. **WANTED:** AK tube socket assemblies (one and two tube type) for AK #10 breadboard restoration, and any other miscellaneous AK parts. James A. DiRuzza, 2607 Old Troy Pike, Dayton, OH 45404, (513) 233-5004 evenings.

WANTED: Sharp oriental-style radios (small decorated wood cabinets); red Crosley Gemchest Model 609 (steel-cabinet consolette with flamingo grill and hinge design); and green RCA 75X series (1948). Gerald Schneider, 3101 Blueford Road, Kensington MD 20895-2726.

FOR SALE: Museum-quality **Guild** radios for connoisseurs. **Model 921 ML "New Englander:"** Three-channel stereophonic 22-tube AM-FM radio-phono combination, five speakers (with separate deflector panels), and other goodies, in early-American style roll-top desk-like cabinet. 39"Wx42"Hx22"D, $600. **Model 785 "Grafonola:"** Stereophonic 12-tube AM-FM radio-phono combination, six speakers (full range), etc., looks like wind-up phonograph with fancy external fiberglass horn speaker, 29½"Hx18"Wx21"D with added 16" turned-wood legs, **plus** rare extension speaker in early-American wood cabinet (really a pre-amp.), 29½Hx19"Wx15¾"D, $500. Both beautiful original solid-wood cabinets, and working. Shipping extra. Gerald Schneider, 3101 Blueford Road, Kensington, MD 20895-2726. Tel.: (301) 929-8593.

WANTED: Radio Today and Radio Retailing magazines. I will buy, or have lots of duplicates to trade. Doug Heimstead, 1349 Hillcrest Dr., Fridley, MN 55432, (612) 571-1387.

FOR SALE: Collectible tubes (or will consider trade for other collectible tubes). S.A.S.E. for list. Sam W. Wrenn, 2314 Seminole Drive 1207, Arlington, TX 76010.

SELLING off large collection of Radio News and Radio Craft magazines. Send for **magazine listing** to Ron Boucher, P. O. Box 541, Goffstown, NH 03045, (603) 497-2988.

KEEP YOUR CALENDAR CLEAR
JUNE 92
ARCA-PARS
NATIONAL CONVENTION

THE ANTIQUE RADIO CLUB OF AMERICA, INC.

Regardless of the month in which you joined ARCA, renewal dues are payable in January.

ONE YEAR dues — **$12.00 US.** in USA/Canada/Mexico, **$14.00 U.S.** in all other countries
FIVE YEAR dues — **50.00 U.S.** in USA/Canada/Mexico, **$60.00 U.S.** in all other countries
LIFE membership dues — **$150.00 U.S.** in USA/Canada/Mexico, **$190.00 U.S.** all other

One time only — convert **FIVE YEAR** membership to **LIFE** membership — **$100.00 U.S.**

(**LIFE** memberships are payable in installments — see Fall 1990 Gazette)

Please make check or money order payable to **ARCA** (Payments from outside the U.S. should be made by International Postal Money Order) and send to:

ARCA • Jim & Barbara Rankin • 3445 Adaline Drive, Stow • OH 44224

New membership card will be mailed to you with next Gazette following receipt of payment.

COLLECTOR BOOKS

Antique Radio Restoration & Price Guide by David & Betty Johnson, 1000 Sets	$12.95
Guide to Old Radios, 225 pages., by David & Betty Johnson, over 350 photos	16.95
Radio Enters The Home, 128 pages., 8.5 X 11	14.95
Radio Equipment & Supplies - 168 page reprint, circa 1922, 8.5 X 11	17.95
1927 Radio Encyclopedia - Gernsback, 179 pages	11.95
Crosley Radio Catalog, circa 1923, 32 pages	4.50
Meissner "How to Build" Instruction Manual 8.5 X 11, 168 pages - NEW	9.95
Short Wave Radio Manual, Official 1934, 260 pages	14.95
How To Repair Old-Time Radios, 162 illustrations, 252 pages	11.95
Vintage Radio Handbook, 263 pages, 1000 illustrations	11.95
Flick Of The Switch 1930-1950, 312 pages, 1000 illustrations	11.95
Most Often Needed Diagrams 1926-1938, 600 models	11.95
1921-1932 Collectors Guide, 264 pages, 9,000 models	11.95
Atwater Kent - 2 Volume Parts & Service Book Reprint, 24 pages. 8.5 X 11	7.95
ARVIN - The First Sixty Years, 263 pages	7.95
Radio For The Millions, a fun book, 192 pages PB	8.95
High Power Wireless Equipment, circa 1910-1911, 99 pages	9.95
Instructions For Operating Grebe Radios, 64 pages pocket size	4.95
Radios of the Baby Boom Era - See Page 32, Vol. 19, #3 for complete details. Each	16.95
Volumes 1 - 6, Radios of the Baby Boom Era. Admiral to Zenith, Complete Set	89.00
Atwater Kent Instruction Book Volume II, an exact color reprint of the original	8.95
How To Build and Operate Short Wave Receivers, 72 pages	7.95
Official Radio Service Manual, 1930 Gernsback, 8.5 X 11, 356 pages	19.95
The Story of Nipper and His Masters Voice, 64 pages, illustrated	9.95
The Cat's Whisker, 50 Years of Wireless Design, HB (rediscovered copies)	14.95
Radio Station Treasury 1900-1946, 8.5 X 11, 176 pages	12.95
Gernsback's Shortwave Library, 10 books, Vols. 1 - 10, each (specify volume)	2.25
Tesla's Experiments With Alternating Current, 170 pages	9.95
Collector's Guide to Antique Radios by Marty & Sue Bunis, 5,000 models, 400 color pictures	16.95
Radio Speaker Encyclopedia, 8.5 X 11, by Floyd A. Paul, 145 photos, 320 mfgs.	11.95
Fifty Years of Radio, March 1938 Issue of Hugo Gernsback's famous publication - 134 pages.	15.95
Radio Manufacturers of the 1920's, Vol. 1, Very Large, by Alan Douglas	22.95
Radio Manufacturers of the 1920's, Vol. 2, by Alan Douglas	26.95
Radio Manufacturers of the 1920's, Vol. 3, - NEW	29.95
Radios – The Golden Age, 120 pages. Full Color by Phil Collins	14.95
Man of High Fidelity, Edwin H. Armstrong, PB, 272 pages	3.50
Vision by Radio by C. Francis Jenkins, 140 pages	9.95
Thomas A. Edison - A Stroke of Luck, PB, 562 pages	13.95
Saga of the Vacuum Tube by Gerald Tyne, 494 pages	15.95
Nikola Tesla, Inventions, Research, Writings, 496 pages PB	16.95
Tesla Coil Secrets, PB	6.95
The Complete Talking Machine, 8.5 X 11, 183 pages. Restoration of antique phonographs	19.95
Vacuum Tubes in Wireless Communication, 5.5 X 8.5. 208 pages - NEW	12.95
222 Radio Circuit Designs, 5.5 X 8.5, 271 pages NEW	11.95
Legacies of Edwin Howard Armstrong, 8.5 X 11, 321 pages NEW	15.95

All orders under $35.00 enclose $1.50 postage - Orders over $35.00 shipped free. (USA Only)

If you would like a full description sheet on any book, just ask.

WE HAVE DETERMINED THAT ALL OF THESE PUBLICATIONS ARE THE VERY BEST OFFSET QUALITY

Allow 3-4 Weeks for Delivery

All funds from Bookstore sales are used to support the Museum of Radio and Technology, Inc.

ORDER FROM

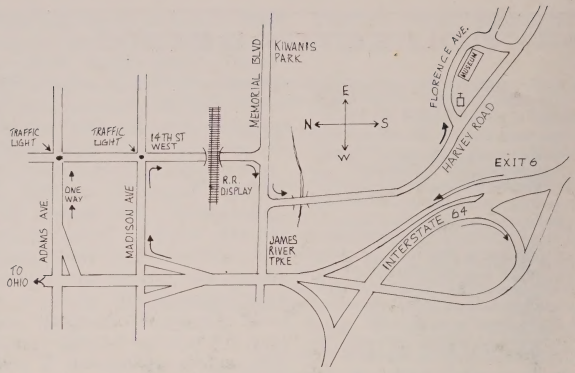
Museum of Radio & Technology, Inc.

Museum Bookstore

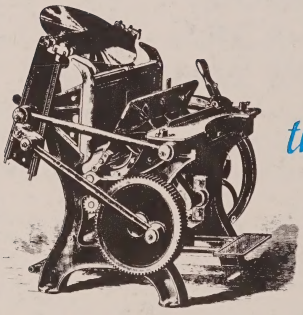
4704 Country Club Boulevard

So. Charleston, West Virginia 25309

Revised 11/1/91



Map of location and directions to
Museum of Radio and Technology Inc., Huntington, WV



the Printing Press Ltd.

Total Graphic Communications

Your Full Color Printing Specialist
Sandy Underwood
304-744-7949